RIG

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Gen. Bernardo O'Higgins (Chile)
Mt. Bransfield
Esperanza (Arg.)
Vega I.
James Ross Island
Trinity I.
C. Kjellman
DAVIS COAST
Plateau
Snow Hill I.
C. Longing
NORDENSKJÖLD COAST
Teniente Matienzo (Arg.)
Robertson I.
C. Disappointment
JASON PENINSULA

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FROM THE EDITOR'S DESK

PETER WAKELIN

Having lived at my present address for a good part of the last 55 years, I have had little reason to throw anything out that I thought might come in handy one day. The certificate signed by King George VI and presented to all schoolchildren at the time marking the end of the war 50 years ago resurfaced recently. I still have a newspaper reporting the death of Sir Winston Churchill in 1965 and my store of NASA Two-Line Elements goes back a mere twenty years. I always retained receipts for my more expensive purchases too.

In 1977 I paid a month's salary for a HP 97 calculator (which is still in everyday use) and 5 years later I spent a fortune on a Commodore Pet with a massive 32kb of RAM! The floppy disk drive was extra, cost as much as the computer and weighed about 15kg! Since then the cost of disk storage has tumbled and shows no sign of slowing down. 500Mb disks seem the norm in PCs these days and a massive 9.1Gb drive was recently advertised for only £1379 which works out at 15 pence per megabyte!

A disk with that capacity can store nearly 200 5-channel HRPT passes. With a 500Mb Pentium machine now much cheaper than a mediocre 286 just a few years ago are we about to witness a huge swing to HRPT reception within RIG? Unfortunately, only things electronic are tumbling in price and soon the computer will be cheaper than the gadgetry to follow the satellite across the sky. Surely someone can come up with a cheap and effective alternative to the ludicrously priced rotators.

The continuing encroachment of pager and other transmissions into the 137-138MHz band may also influence the move towards HRPT. After all, if you find you need a directional antenna for interference-free APT reception then you are well on the way to the cost of a HRPT system.

A well-known UK manufacturer has recently reduced his HRPT prices and has some further improvements in the pipeline. Also, we are hearing very interesting noises coming out of Italy. HRPT enthusiasts there are up to something and we hope to know more soon.

Finally, a brief word about the annual general meeting. The committee decided to combine the agm with the Guildford Conference to attract a larger than usual attendance. With hindsight I believe that was a serious error. In view of the embarrassing proceedings I would have preferred a minimal attendance. I almost joined the 30 people who walked out. It was a regrettable end to an otherwise interesting and enjoyable day. ⊕

RADIOCOMMUNICATIONS AGENCY WEATHER SATELLITE RECEIVER PROJECT.

John Tellick

As many members will know RIG has been involved in a rather lengthy dialogue with the RA regarding the issues of registration, protection of the 137-138MHz band, allocation of satellite mobile communications in this band and pager intereference. This dialogue resulted in a meeting between RIG and the RA in May last year and culminated in the RA's offer to undertake 'tests' of typical RIG receivers in order to ascertain if any improvements could be suggested to reduce the problems experienced by some members from paging transmissions. The 'tests' have been carried out and the results published in a very comprehensive 17 page report. I would like to thank Terry Jeacock, Brian Last and Robert Cooper from the RA for arranging these tests and John Mellish from the RA's Radio Technology and Compatibilty Group who undertook the tests and wrote the report. Ray Godden, who designed the new RIGsat receiver, has digested all the figures and condensed them into headed sections for which I am very grateful.

I undertook a purely non technical 'test' of all the project receivers to see how they coped in the field. Living in an urban area of SW London with some nearby industrial estates, which include many electronics firms, I'm in a high-density pager area - and it shows. I have a 137.975MHz pager about 2.5km away and numerous 138+MHz pagers nearby. The RA are very reluctant to divulge this commercially sensitive information to me. Add to these lawn mowers, washing machines, hair dryers etc. etc - the products of suburbian life and some odd RF signals, attempting to download images from Meteor 3-5 over Greenland can be a bit frustrating. In the 'good old days', it was no problem. In addition to all this crud there are now pager-like (on and off for varying periods of time but with no apparent modulation) transmissions at 137.815MHz and 137.215MHz. These, I have now been informed by the RA, are legitimate secondary users of the band. I have requested more information about these but so far to no avail. Back to my 'tests'; it's very much a case of if the pagers don't get you the secondary user on 137.815MHz will as far as reception on Meteor's 137.85MHz goes. I have to say that I have little trouble at NOAA frequencies and lower Meteor frequencies apart from urban electrical interference and the odd unidentified RF that appears in the band at times. One of the receivers coped well with both pagers and secondary user but is, alas, no longer available. One coped with the pagers but not the secondary user and one coped with the secondary user but not the pagers.

Without wishing to duplicate anything in Ray Godden's article in this Journal I would like to detail some of the RA's comments and suggestions. In a way I'm a little disappointed our receivers performed so well as it appears that there is little we can do to

overcome the problems some members are having. As not all the allocated pager channels are operational yet the problem is not going to improve.

The RA begin their report thus;

> "The interference reported is not, in general, due to any failings on the part of the meteorological satellite receivers being used by the hobbyists, or the paging transmitters. Receiver rejection will be the dominant interference mechanism when the frequency separation between the meteorological satellite and paging transmitter is relatively small. At greater separations (and for intermodulation) a balance exists between transmitter and receiver performance, except for very weak signal levels where transmitter noise becomes dominant."

The report then talks about pager transmitter density and predicted interference.

> "The distance at which interference can be expected from a 100W erp paging transmitter is up to 1.6km [9.8km free space path loss] with 100kHz separation between the two systems, 1.2km [5.5km fspl] with 300kHz separation and 700 metres [1.7km fspl] with 1MHz separation between the two systems. Intermodulation may also result interference at distances of up to 2.2km [17.4km fspl]."

The first figure is for high urban density areas and the bracketed for line of site - your antenna 'seeing' the pager antenna. In practice interference might be experienced up to the fspl figure depending on the local environment.

> "The average density of 138.0 to 138.2 MHz 100 Watt paging transmitters in th UK is currently of the order of one site (radiating two channels) every 18km. It is therefore predicted that the reception of meteorological satellite by hobbyists will suffer impairment due to paging transmissions in approximately 10% of the reception locations. This would appear to account for the widespread interference reported. The possibilty of interference due to a faulty paging transmitter should not be overlooked however, although there is no evidence of this."

In fact at many sites there will be two paging transmitters one for each of the two operators both radiating on two channels. Later in the report it is stated that most hobbyists will be within 9km of at least one paging transmitter.

> "No simple, or universal solution to this compatibility problem has been identified although suggestions are made that might provide a means of reducing the interference in some cases."

Ray Godden's article details possible receiver improvements; selectivity and better strong signal handling performance.

The RA do think improvements could be made at the transmitter since they report:

> "The specified intermodulation performance of paging transmitters is very high in order to protect PMR and similar services on common sites, although it could cause interference to meteorological satellite receivers operating at their maximum usable sensitivity. Improving this performance, even if practical, is unlikely to significantly reduce the magnitude of the interference as inter-modulation within the receiver is also a problem. N.B. The effect of other non-linearities in the vicinity of the transmitter have not been assessed e.g. the 'rusty bolt effect'."

At the antenna the RA suggest experimentation since paging transmitters are vertically polarisation.

> "The use of a linear horizontally polarised antenna, rather than a circularly polarised antenna, for the reception of meteorological satellites may increase the signal to interference ratio by about 10 dB. This might be considered by hobbyists employing a steerable, directional antenna. The use of 'crossed dipole' type antennas for the reception of meteorological satellites appears quite common. These should offer reasonable rejection of the vertically polarised paging signals."

There is a large pool of expertise out there amongst RIG members in both receiver and antenna design. If you have experimented with ways to reduce these problems and have been successful please let us know so that we can pass on the information via the Journal. Remember our current problems are not going to get any better and could get worse in the future. ⊕

RADIOCOMMUNICATIONS AGENCY RECEIVER TESTS

Ray Godden

John Tellick has been pursuing a continuing dialogue between RIG and the Radiocommunications Agency of the Department of Trade and Industry regarding the severe interference some of our members have been experiencing in the 137MHz band from pager transmissions. To determine whether or not inadequate receiver performance was a factor the RA agreed to conduct tests on typical 137MHz receivers. A report "Protection of Meteorological Satellite Receivers [Used by Hobbyists] Operating at 137MHz - 138MHz" has been issued. This article is to summarise and comment on this detailed and comprehensive report.

PAGER INTERFERENCE

The RA has allocated the pager operators frequencies close to, in one case just within at 137.975MHz, the space-to-earth meteorological band of 137MHz - 138MHz. We are also aware of pager-like transmissions within the band at 137.21MHz and 137.81MHz. The RA tell us that these transmissions, origin not disclosed, are legitimate. Pager transmitters in the UK are at an average density of one every 18km with an e.r.p (effective radiated power) of 100W. This is to be compared to the low e.r.p. (5W?) and long range of weather satellite transmissions.

THE RECEIVERS TESTED

Two commercially manufactured receivers
One home constructed receiver based on a commercially manufactured and aligned main board
One home constructed receiver (actually a hand wired prototype of the RIG*sat* RX1)
One commercially manufactured pre-amplifier (limited tests only with its corresponding receiver)

The receivers are not named in the report but we have identified the RX1 from its performance figures.

SENSITIVITY

The level of a simulated satellite signal to give 20dB SINAD (Signal to Noise and Distortion ratio) was measured. Results range from -11.5dB (0.27µV) to -5.5dB (0.53µV). The RX1 measured -10.5dB (0.29µV). These are sensitive receivers, as is required for the application.

CO-CHANNEL REJECTION

The level of a co-channel CW signal to reduce SINAD 6dB (from 20 to 14) was measured. Expressed as a rejection ratio (wanted to unwanted) results range from +7dB to +9.5dB. The RX1 measured +9.5dB.

OUT OF CHANNEL REJECTION

Measurements were made at a number of frequency offsets. At the adjacent channel (50kHz offset), averaging + and - offsets, results range from 71dB (unwanted to wanted) to 28.5dB. 71dB is the RX1 figure. At 300kHz offset the range is 73dB (RX1) to 94dB.

SPURIOUS RESPONSES

The only significant spurious responses found were at the image frequency (-21.4MHz). For this the range was (unwanted to wanted) 51dB to 68dB: 56dB for the RX1.

INTERMODULATION PERFORMANCE

Measured by placing a simulated satellite signal 2MHz above the receive frequency and a CW signal 1MHz above the receive frequency. Expressed as Relative Suppression (unwanted to wanted for 20dB SINAD) figures from +63.2dB to +69.8dB (RX1 66.4dB) were measured. Expressed as 3rd order intercept point the figures were from -7.8dBm to -23.7dBm (RX1 -17.9dBm).

DIFFERENCE BETWEEN CW AND PAGER INTERFERENCE

At frequency offsets in excess of 100kHz there was no measurable difference between CW and pager interference. At closer offsets pager signals caused greater interference than CW signals.

DISCUSSION OF RECEIVER PERFORMANCES

In general, bearing in mind the application which requires high sensitivity, the average performance is regarded as satisfactory. Some parameters could be improved. Adjacent channel rejection should be in excess of 60dB and the average for the receivers tested was 51dB (RX1 71dB). One receiver had a highly asymmetric response. The average third order intercept point was -15.9dBm (RX1 -17.9dBm) which is "slightly disappointing even when the sensitivity of the receivers is taken into account". The image responses of the receivers at -21.4MHz are thought to be excessive.

ANALYSIS OF THE COMPATIBILITY PROBLEM

The Report has a thorough analysis of the compatibility problem taking into account the application, pager transmitter performance and receiver performance.

The principle performance factors are:

1. Receiver rejection at pager frequencies
2. Transmitter wideband noise
3. Receiver intermodulation
4. Transmitter intermodulation

Of these (1) and (2) are the most significant and are finely balanced i.e. to improve compatibility *both* should be improved. Taking into account the pager frequencies in

use, receiver intermodulation is not likely to be a problem for received frequencies below 137.775MHz. The receivers did not have good figures for image response; the image frequencies fall in the aeronautical radio navigation band e.g. ILS VOR NDBs etc. rather than aircraft communications so that in practice this is probably not problematic.

Calculations show that the reception of meteorological satellites by hobbyists will be impaired by pager transmissions in about 10% of cases.

RECEIVER IMPROVEMENTS

When the separation between pager and satellite frequencies is relatively small the out-of-channel receiver rejection is the dominant interference mechanism. For the higher frequency satellite channels therefore interference could be reduced by improving selectivity. Neither this nor improving blocking performance would help reception of the lower frequency satellite channels because of transmitter noise. Reducing the receiver's bandwidth to the absolute minimum would reduce the effect of transmitter noise and aid selectivity but AFC (automatic frequency control) might be necessary to track Doppler shift.

Receiver INTERMODULATION performance is slightly disappointing. Although it is unlikely that any improvement could be engineered without sacrificing sensitivity, manufacturers and hobbyists might consider re-evaluating the balance between sensitivity and strong signal handling performance now that the band is becoming more congested. "A lower sensitivity receiver with optional pre-amplifier (as offered by one manufacturer), or a selectable 'low noise' or 'low distortion' front end would provide the hobbyist with the means to optimise the system for the particular receiving location."

A cavity filter (large and expensive) could be used to reject interference but would not help with regard to transmitter noise.

ANTENNAS TO IMPROVE THE SIGNAL TO INTERFERENCE RATIO

Pager transmitters are vertically polarised whereas meteorological satellites radiate a circularly polarised signal. A crossed dipole antenna is effectively horizontally polarised for signals near the horizon: this provides some rejection of pager signals. An antenna at ground level can still 'see' the satellite and have a degree of screening from the pager site, albeit at the expense of low angle satellite signals.

To summarise very briefly, the limiting factors are for the transmitter intermodulation performance and wideband noise and for the receiver intermodulation performance and out-of-channel rejection.

REPORT CONCLUSIONS

"That hobbyists consider experimenting with antenna type and position, to maximise the signal to interference ratio presented to the receiver".

"That manufacturers and hobbyists consider looking at the selectivity, and re-evaluating the balance between sensitivity and strong signal handling performance of the meteorological receivers in use, now that the band is becoming more congested. It should be emphasised that this does not imply that the current receiver performance is poor, or that such an evaluation would not conclude that the present design is still optimum for the current band conditions i.e. the limited improvements attainable might not justify the additional cost".

COMMENTS REGARDING THE RIG*sat* RX1 (Ray Godden)

For most performance parameters the RX1 is comparable with the average of the receivers tested. It is more sensitive than the average, has significantly better adjacent channel selectivity and rather worse selectivity further from the wanted channel. This is thought to be largely due to leakage around the I.F. crystal filter in the hand wired prototype; the P.C.B. version should be improved in this respect, particularly if the suggested screen between the filter connection pins is fitted. Adjacent channel selectivity is important because members are suffering interference on the Meteor frequency of 137.85MHz from the transmissions at 137.81MHz (not considered in the report).

RIG CONFERENCE

I would just like to say very briefly, as the Journal goes to press, a big Thank You from the committee to Frank Bell for all his hard work in setting up, single handedly, the one-day conference at Guildford on 29 April. I am sure that all those members who attended would agree that it was a very interesting and enjoyable day.

Thanks also to the speakers for an informative and interesting programme ranging from Russian space activity from the 'good old days' to the present, to keeping an eye on Henry's crops from space and monitoring oil pollution at sea to downloading NOAA and Meteor images 'on the roof of the world'. From CCD imaging aboard UoSATs to GPS receivers on tractors! - Whatever next?. And results from ERS-1.

Thanks are also due to The Royal Grammar School, Guildford, for making us welcome and to the exhibitors for their displays and advice. It was good to meet so many members, especially those from abroad. Once again, a very enjoyable day and we look forward to the next conference. John Tellick.

MAKING GIF IMAGES FROM PROSAT II
A Beginners' Guide
Les Hamilton

Looking back to earlier years, when my interest in weather satellite imaging was in its formative stage, I remember how impressed I was when, having at last acquired a PC, I was able to view GIF images from weather satellites that I obtained through the RIG GIF Library. These prompted me to invest in the PROsat II card within two months of gaining my computer, and the very day it arrived in the post I captured my first images. Now capturing images and viewing them with PROsat II is one thing, but these images are not readily transportable to platforms lacking the PROsat software, nor can they be viewed with any of the proprietary image viewing programs. Moreover, they are bulky to store. Having read that the GIF format was ideal as a means of storing such images in a compressed form (actually it isn't, but it was the de facto standard of the day), I naturally looked towards achieving this aim. But did the PROsat manual even mention GIF? Not a bit of it! I was on my own! If one were easily satisfied, then it was possible to effect crude screen dumps of the PROsat screen by means of the Alt-X (PCX) , Alt-B (BMP) or Alt-S (SCF) key combinations while an image was displayed. Unfortunately, the results of this method are ruined by the inclusion of the PROsat menu bar and the mouse pointer in the result. No, this was definitely not the way to go about producing good, crisp images.

So how are we to produce usable images from weather satellite information gathered using PROsat II, without including irrelevant distracting detail and, if need be, including the entire pass, not just a software-determined zoom? The best answer of all is to use the utility NOATIFF (available on RIG Shareware Disk F-01). This software was written a couple of years ago by one of RIG's Italian members Paolo Cerretti. Its name indicates that it converts the .NOA data files produced by PROsat II directly into TIF images, yet another well documented image format accepted by a wide range of viewing software. Since the TIF images are still as bulky as the original PROsat files, we still have some work to do, but we are heading in the right direction. [By the way Paolo, if you are reading this, what about a version of the program that includes the option for direct conversion to GIF?].

Using NOATIFF

NOATIFF comes ready for use as the file NOATIFF.EXE. When run, it first takes you through the configuration screen. Since at this stage you are unlikely to need to alter anything, just keep pressing the <enter> key till you reach the foot of the screen, then answer <Y> to the "Store the changes" prompt. Pressing <enter> once more takes you into the <Mode> menu with the item <Timestep Polars> highlighted. Press enter once more, and a menu of all the .NOA files in your C:\VGASAT4 directory will be presented. Select one of these by means of the cursor keys, and press <enter> for the last

time. Processing starts immediately, with details of the file being displayed. Within ten seconds, the process is complete, and a file IMAGE.TIF appears in the VGASAT4 directory alongside the original IMAGE.NOA (N.B. 'IMAGE' in this context represents the name you chose for your original file). Exit from NOATIFF by pressing function key f-2.

Processing the TIF Image

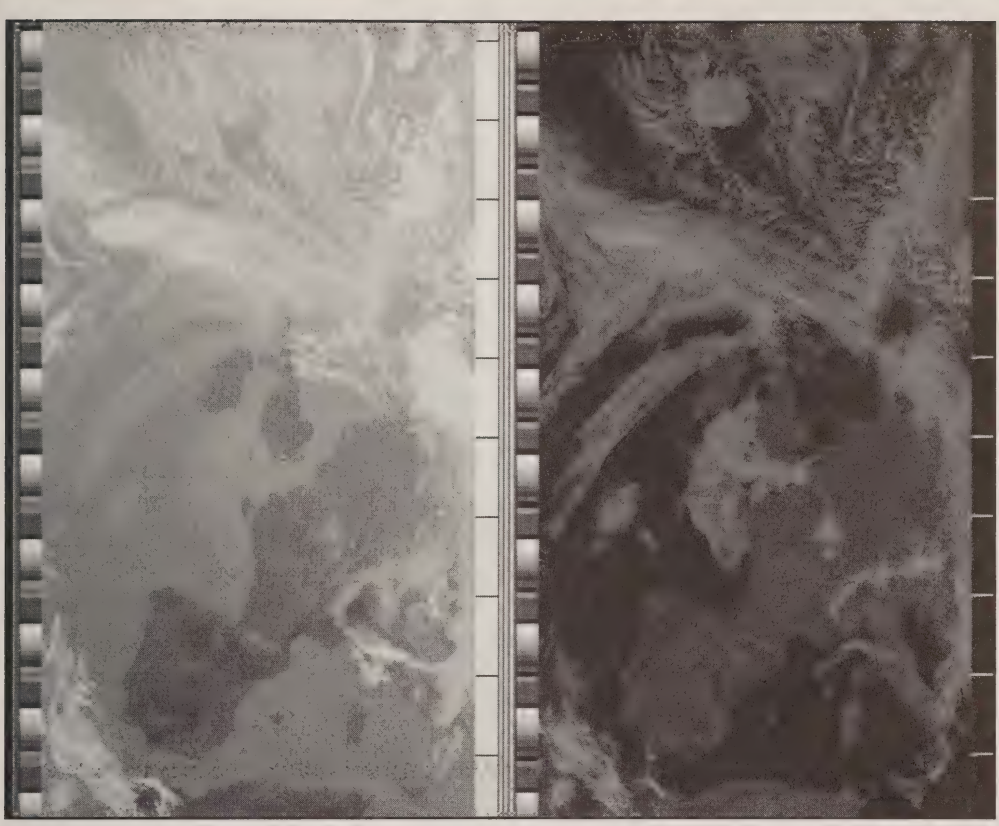
TIF images are fairly easily converted into GIF images using a number of readily available processing packages. My own favourites are PHOTOLAB and Paintshop Pro which are both Windows programs. In my opinion, the former has a distinct edge in terms of speed and it also includes a very efficient cropping tool. It is therefore possible to convert an image in its entirety, or crop out regions of little interest. Another possibility is NEOPAINT, which some will prefer because it is a DOS program. Be warned though, although it has the same features as PHOTOLAB, it is much slower and does not always recognise TIF images. Additionally, I have found NEOPAINT less than 100% reliable when saving images, and have had a few badly corrupted BMPs and TIFs from it. It does appear to be reliable when saving in the GIF format, though, so try it if you wish.

Let's assume you are going to use PHOTOLAB (Shareware Disk I-06). The program has recently been upgraded to version 2.0, and though there are no visible changes, it does show increased speed, always an important consideration with large image files. Load PHOTOLAB, and click the mouse over the opening screen to activate it. Select <File> from the Menu Bar, followed by <Open>, and select your TIF image from the file selection box that appears. At this point you may be in for a surprise. The image may well appear upside down. No! There's nothing wrong; this means that you captured the image when the satellite was travelling south-to-north, so that the first image line captured was at the foot of the image. From the <Image> menu, select <Mirror>, then <Flip> to correct the orientation, and finally <Save> from the <File> menu to re-save the TIF image in the correct orientation.

If you wish to convert the entire image into a GIF version, return to the <File> menu, but this time click on <Save As ...>. Open the file type browser at lower left by clicking on the arrow, and select the item "GIF Images [*.GIF]" ; then move the mouse to the <Filename> box at top left and click before the star (*). Press the <Delete> key to remove the star symbol, and type in a suitable name for your GIF image (maximum of eight characters). End by clicking on <OK>, and the job is done.

Cropping an Image

If you wish to save only part of an image, PHOTOLAB's <Edit> menu contains a cunning device to allow just that. Click on the <Select> item at the foot of the <Edit>



menu, and the mouse cursor changes into a cross-hair. If you click the mouse over any part of an image, and, keeping the mouse button depressed, drag it to another location in the image, a dotted rectangle appears when the mouse button is released. While this rectangle is displayed, it is simplicity itself to crop the margins and leave just the selected rectangle on screen. Do this from the <Image> menu by selecting the <Crop> item. The cropped image can now be saved as above.

For the newcomer, all the above may seem daunting but, rest assured, its really very simple indeed. Try it out and before long you will be sprinting through all the steps in seconds. Indeed, the entire process should take under a minute with just a little practice. You can speed everything up by accessing NOATIFF from Windows - there is no need to move back and forth between DOS and Windows. And for those who prefer not to use Windows (and I generally include myself in this category), just try PHOTOLAB. For speed, it beats any DOS program out of sight.

The image reproduced here shows what can be achieved. It was received from NOAA 14 on 2 April 1995. So if you have always yearned to make GIFs of complete satellite passes, you now know how. Give it a go! ⊕

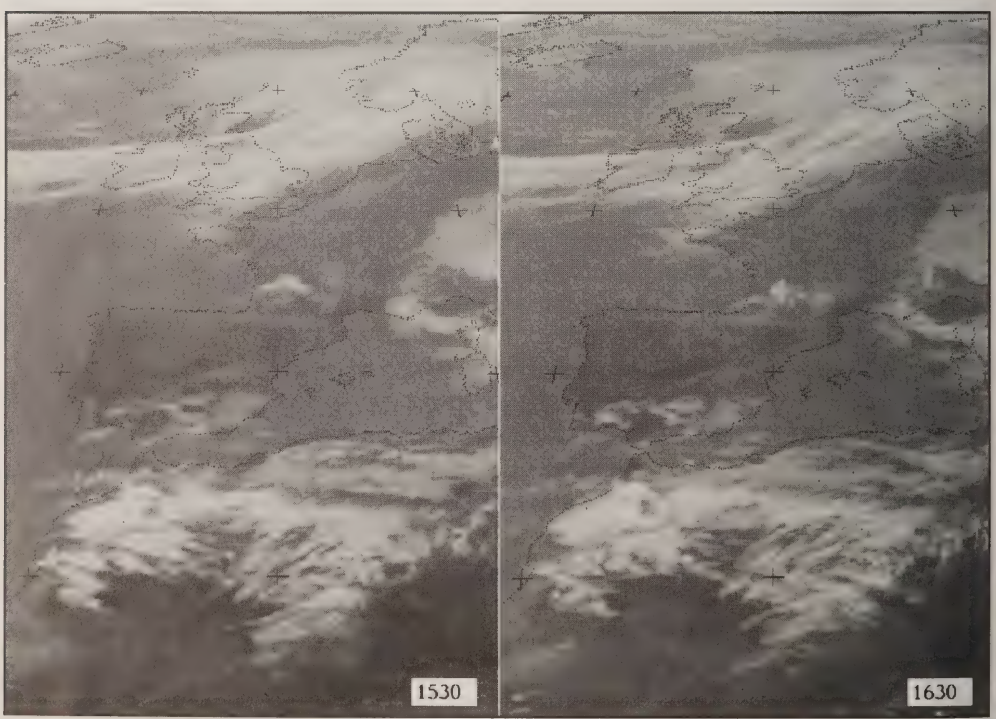
INTERPRETING WEATHER SATELLITE IMAGERY - PART 11

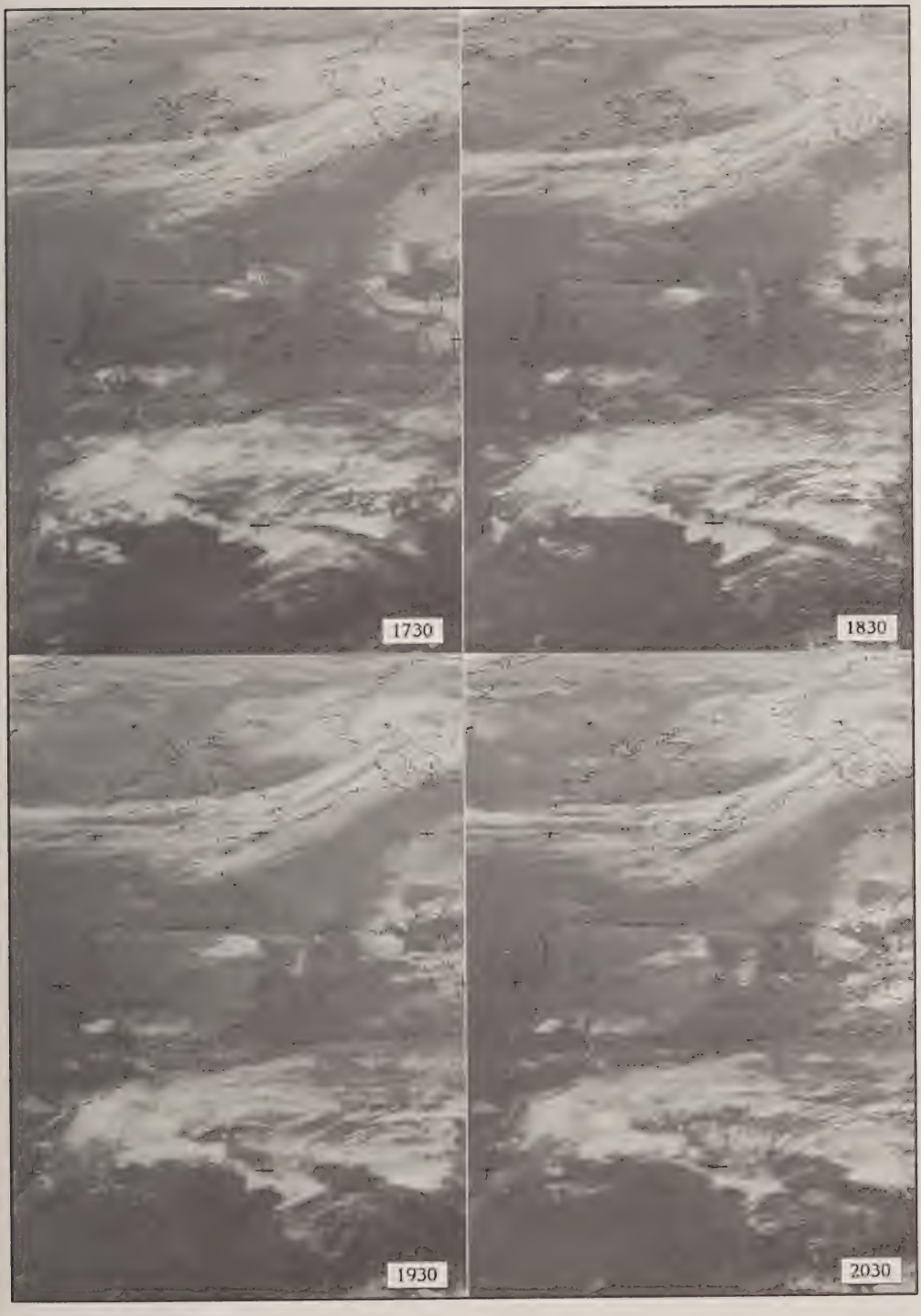
Peter Wakelin

It is possible to extract a lot of information from a single satellite image and a pair of images in different spectral bands can reveal much more. By taking a sequence of images at intervals much can be learned about the evolution and movement of weather systems.

Some polar-orbiting Earth-imaging spacecraft such as SPOT, ERS-1 and 2 and the Japanese JERS series are operated in precisely controlled sun-synchronous orbits and pass over exactly the same ground track after intervals which may be a couple of days or several weeks depending on the mission's requirements. If three or more images taken of the same scene taken at different times are allocated different colours and combined then any changes that have occured during the sampling period can be readily detected. This multi-temporal imaging as it is called is ideal for monitoring such things as changes in land use and crop development and for monitoring the extent of deforestation, flooding and forest fire damage.

However, weather changes are far more rapid and multi-temporal imaging from polar-orbiting weather satellites is not yet feasible. The logistics of providing and oper-




1730
1830
1930
2030

ating a constellation of weather satellites to image every point on Earth every 30 minutes would be colossal and very expensive. The alternative is, of course, the geostationary weather satellite which can view almost half the Earth continuously. Their use in monitoring the weather was demonstrated as far back as 1966 when ATS 1 was launched. Their main drawbacks are their great distance and their oblique view of the Earth's surface at high latitudes.

Printing six images taken at hourly intervals side-by-side on a couple of pages is a poor substitute for viewing them on a monitor in quick succession but I have selected a sequence where movement was rapid and, hopefully, I can convince you of the value of these animated sequences or 'movie-loops' as they are sometimes called. They do however, need a little skill in interpreting the apparent movements displayed.

This sequence was received from Meteosat 5's primary data channel on 14 April 1995 between 1530 and 2030UT. There are three main areas on these images I will comment on. Firstly, there's the depression in the North Sea and its associated cold front over the British Isles, then there's that patch of cloud over southern France and, finally, the mass of cloud over north Africa.

Using the indicated coastlines and 10-degree markers as reference points it is easy to see that the cloud mass in the North Sea tranfers eastwards a considerable distance over the 5 hour time-span. Likewise it can be seen that the northern edge of the cloud band over Britain moves steadily southwards during the sequence. Now does this mean that there was a strong westerly wind over the North Sea at the height of the cloud tops and a lighter northerly wind over Britain?

Repeatedly in this series I emphasise that atmospheric motion is three-dimensional and without vertical motion there would be no weather. When a depression moves, it is not simply a case of a vast mass of atmosphere being moved en bloc to another location but more a case of the low pressure system moving *through* the atmosphere and distorting the airflow for a time as it does so. It is widely realised that air circulates counter-clockwise round depressions in the northern hemisphere but this circulation typically extends to only 4 or 5km and above that the more general westerly flow is less distorted. The highest clouds associated with temperate latitude depressions are typically around 10km and a wind-flow chart at this height would normally show a pole-ward bulge in the westerly flow resulting in a northwesterly wind ahead of the depression and a southwesterly one behind it. So to answer the question I posed in the last paragraph, the movement of the cloud mass in the North Sea would give an indication of the speed and direction of movement of the depression but this would not be the same as the speed and direction of wind at cloud height. There is no doubt that the front over Britain moved south but at the height of these clouds the winds blow almost parallel to active fronts.

Cloud movement determined from geostationary satellite imagery can be used to derive winds but the clouds selected for measurement have to be chosen carefully. The patch of bright cloud over SW France is well clear of both the northern depression and the cloud mass over north Africa so it may seem a likely choice. There is little doubt that this cloud is being carried quickly in a strong northeast wind and after 5 hours has crossed into Spain. However, there is an additional complication here which would make accurate wind speed measurement well nigh impossible. The terrain below has a major affect on the appearance of this patch of cloud. It is easily noticeable on the animated sequence on the monitor but even on the printed images it can be seen that the brightness and size vary and you may be able to detect that the movement is very erratic. Even at 10km altitude the airflow is disturbed by high ground below and in this example the air has passed over the Central Massif, descended, then risen over the Pyrenees and descended into Spain. On descending, the air is warmed and some of the cloud evaporates then on being forced up over the 3km high barrier of the Pyrenees more vapour condenses out as cloud only to evaporate later over Spain. In some situations, water may condense out only at the crests of these waves and evaporate completely on descending into the trough so clouds will appear to remain stationary over mountains even though a strong wind may be blowing through them.

The above examples demonstrate once again that weather satellite images need a great deal of care in interpreting. Earlier, I wrote that the circulation around depressions extends upwards only to about 5km but there are situations where circulations exist at much higher altitudes. In these 'upper lows' the air is colder than the surrounding air so convection and showers or thunderstorms are often associated with them when the surface below is warm enough. Such a situation exists over Morocco in this sequence where the clouds are circulating around a point close to Marrakech. As convective clouds are naturally quite short-lived, this circulation may me less obvious on this short sequence of printed images.

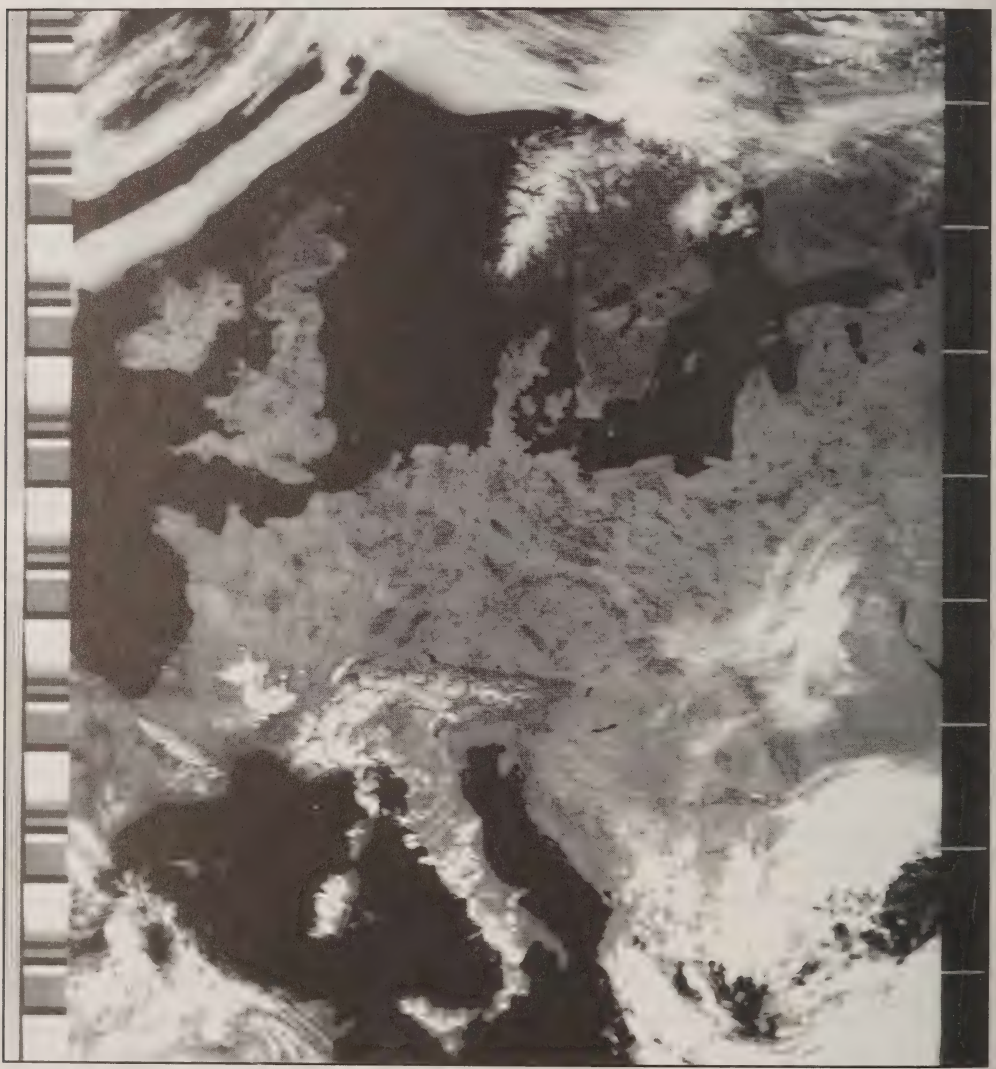
I use Timestep's animation software on their PDUS system and I find it most enlightening to be able to zoom in and pan around the high resolution images. I only wish I had had something even half as good when I was forecasting in the Falkland Islands just a few years ago. ⊕

HELP WANTED

RIG is looking for someone experienced in framestore matters who would be willing to deal with the occasional telephone enquiry from members. Anyone willing to have his or her name on the Helpline page is invited to contact the Secretary. ⊕

BLUE LEDs

Andrew McGuffie was one of the first to get his hands on one of the bright, blue LEDs mentioned in RIG 40. He utilised it in place of a crater-tube, which are difficult to come by now and very expensive, in his home-built photo-fax system to produce this fine pair of images from recorded signals transmitted by NOAA 11 on 3 May 1990. The individual scan lines making up the image are barely discernible on the original but re-scanning for publication may make them more prominent. We hope to have more information on this exciting development in the September journal.



THE INTERNET (part 2)

Tom Larkin

How to access the Internet

For many Internet users, the academic route is the best, least expensive and easiest route to follow to the Internet. That's because most educational institutions have some sort of Internet access for students and faculty. As a member of one of these groups at a college, university, technical school or high school you should already have access rights to the Internet. Procedures vary at each institution of course, but frequently the only requirement is that you are a student with one or more classes or a member of the faculty.

Accessing the Internet through a governmental facility can be more complicated than from a university setting because of the security issues. In general, if there is a local network serving your department or workgroup then a facility-wide or regional wide network may also exist and likewise have access to the Internet. Many large corporations also use the Internet regularly to conduct research, to email each other or to transfer information from one division to another. If none of these options is available to you then you will have to opt for a telephone line link, via a modem, to one of the commercial Internet service providers.

The phone system is fine for carrying audio signals that generally require a relatively narrow frequency range, say from about 300 Hz to 3000 Hz but this severly limits the transmission of high speed computer data. Luckily, technology has produced modems capable of speeds up to 14,400 bps that are inexpensive. For example, a 14,400 bps modem can send about 1,440 characters per second remembering that it takes eight bits to represent a single character and depending on the protocol used, there may be one or two bits for error correction and other uses.

Whichever method you use to access the system the basic Internet tools are the same. As well as sending and receiving electronic mail (e-mail) there are two main ones which I will describe here:

Archie

The utility Archie is a way to find program or data files on the Internet. Archie is a database of directory listings from Internet computers whose operators have registered their files for general access. The list is updated periodically. It is usual practice to use the Archie server nearest to you and in the UK, one can find it at archie.doc.ic.ac.uk with IP address 146.169.11.3. In Germany, one would use archie.th-darmstadt.de [130.83.22.60] or in Finland, archie.funet.fi [128.214.6.102]. To gain access to the

Archie server you would issue a TELNET command:

```
telnet archie.doc.ic.ac.uk
```

The username prompt would appear and also a simple set of instructions. You would generally use 'archie' as the username and away you go. You could try searching for INTERNET with the command "find INTERNET" and within a few minutes it should return a list of all files with the filename INTERNET. Note it is a FILESEARCH utility and does not look inside files for the keyword INTERNET.

Once you know the location of the file that you are interested in you can then connect to that site and download it.

FTP

FTP, or File Transfer Protocol, is the primary and most common method of obtaining files on the Internet. Together with the powerful search facilities of ARCHIE it provides a quick and easy solution to obtaining the required files, be they text documents for a word-processor, pictures, audio files or executable programs for your computer. Once you know where the file you want resides then you can get it with the FTP command.

Some sites offer what is called ANONYMOUS ftp access. This allows anyone to log into the machine but usually with limited access to files. It is worth noting that src.doc.ic.ac.uk has an anonymous ftp capability - together with the use of archie there are 1000s of files for PCs (or whatever) that you can obtain.

World Wide Web

One of the major growth areas within the Internet is what is know as the WWW or the World Wide Web. This is the ultimate in computer interfacing and brings together text based, graphical and audio information to the user at the click of the mouse. It is done through the use of 'hypermedia' which at is simplest is a text based database that includes links among the documents - these links can be pictures, text, movie files, sound files either on the local machine or anywhere in the world. By selecting a specific link within the document it is possible to find more links and depending on how the particular text groupings are organised it may be possible to continue this 'hopping' procedure around the world from computer to computer until either daybreak occurs or you realise the cost of your telephone bill !

I will cover the WWW in more detail in the next article and include some examples of just how really useful and real the INTERNET is for Remote Sensing enthusiasts.

FTP SITES FOR IMAGES AND WEATHER MAPS

Satellite Images of North America

ftp:/early-bird.think.com	/pub/weather/maps/
ftp:/ftp.uwp.edu	/pub/wx/
ftp:/kestrel.umd.edu	/pub/wx/
ftp:/wmaps.aoc.nrao.edu	/pub/wx/
ftp:/wuarchive.wustl.edu	/multimedia/images/wx/
ftp:/wx.research.att.com	/wx/

Satellite Images of Europe

ftp:/ftp.met.ed.ac.uk/	
ftp:/ccn7.ccc.nott.ac.uk	/pub/sat-images/
ftp:/ftp.sat.dundee.ac.uk/	
ftp:/liasun3.epfl.ch	
ftp:/plaza.aarnet.edu.au	
ftp:/unicorn.nott.ac.uk	/pub/sat-images/
ftp:/wilbur.stanford.edu	

Satellite Images of the Pacific

ftp:/boa.gsfc.nasa.gov	/Weather/gms/
ftp:/ftp.gphs.vuw.ac.nz	/pub/weather/pictures
ftp:/ftp.jcu.edu.au	/JCUMetSat/
ftp:/explorer.arc.nasa.gov	/pub/Weather/
ftp:/plaza.aarnet.edu.au	/Weather
ftp:/hydro.iis.u-tokyo.ac.jp	/data/noaa/
ftp:/satftp.soest.hawaii.edu/	
ftp:/wilbur.stanford.edu/	

Weather and forecasts (maps, radar, soundings)

ftp:/early-bird.think.com	/pub/weather/maps/
ftp:/ftp.uwp.edu	/pub/wx/
ftp:/kestrel.umd.edu	/pub/wx/
ftp:/wmaps.aoc.nrao.edu	/pub/wx/
ftp:/wuarchive.wustl.edu	/multimedia/images/wx/

References:

1. Welcome to ... Internet From Mystery to Mastery (MIS Press)
2. Zen and the Art of the Internet (Brendan P Kehoe)
3. Meteorological Data FAQ (Ilana Stern) (available on Internet FTP://rtfm.mit.edu/weather/data/)

GOES 8 OBSERVES ECLIPSE

The moon's shadow swept across South America on 29 April and the reduction in solar illumination was very noticeable on GOES 8 visible images. As the moon's distance from Earth was well in excess of its average distance, its angular size was less than that of the sun so no point on Earth was totally devoid of sunlight during the eclipse.

At 1715UT, the time of the first image, the local time in equatorial South America was close to noon yet the coast of northern Peru was invisible. 90 minutes later the moon's shadow reached northern Brazil and the shower clouds over the Amazon basin were barely discernible.

GOES 8 29 April 1995 1715UT

[A sequence of images spanning the eclipse period was made available on Internet by Dennis Chesters, NASA GSFC, to whom we are grateful. (ftp://climate.gsfc.nasa.gov/pub/chesters/goes/950429.eclipse) Ed]

GOES 8 29 April 1995 1845UT

RIG REGIONAL MEETING - ISLE OF WIGHT

A local meeting will be held at West End, Walkers Lane, Shorwell, Isle of Wight (Tel. 740039) at 1030 on Saturday 17 June 1995. Further details from Mr AF Bareham on 01983 531481.

IMAGES FROM ABERDEEN

Les Hamilton

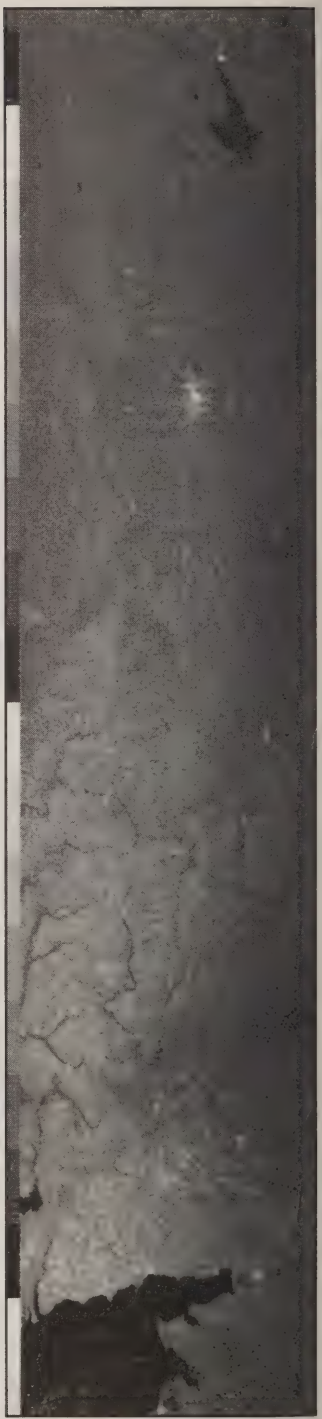
Superb Imagery from Okean 4

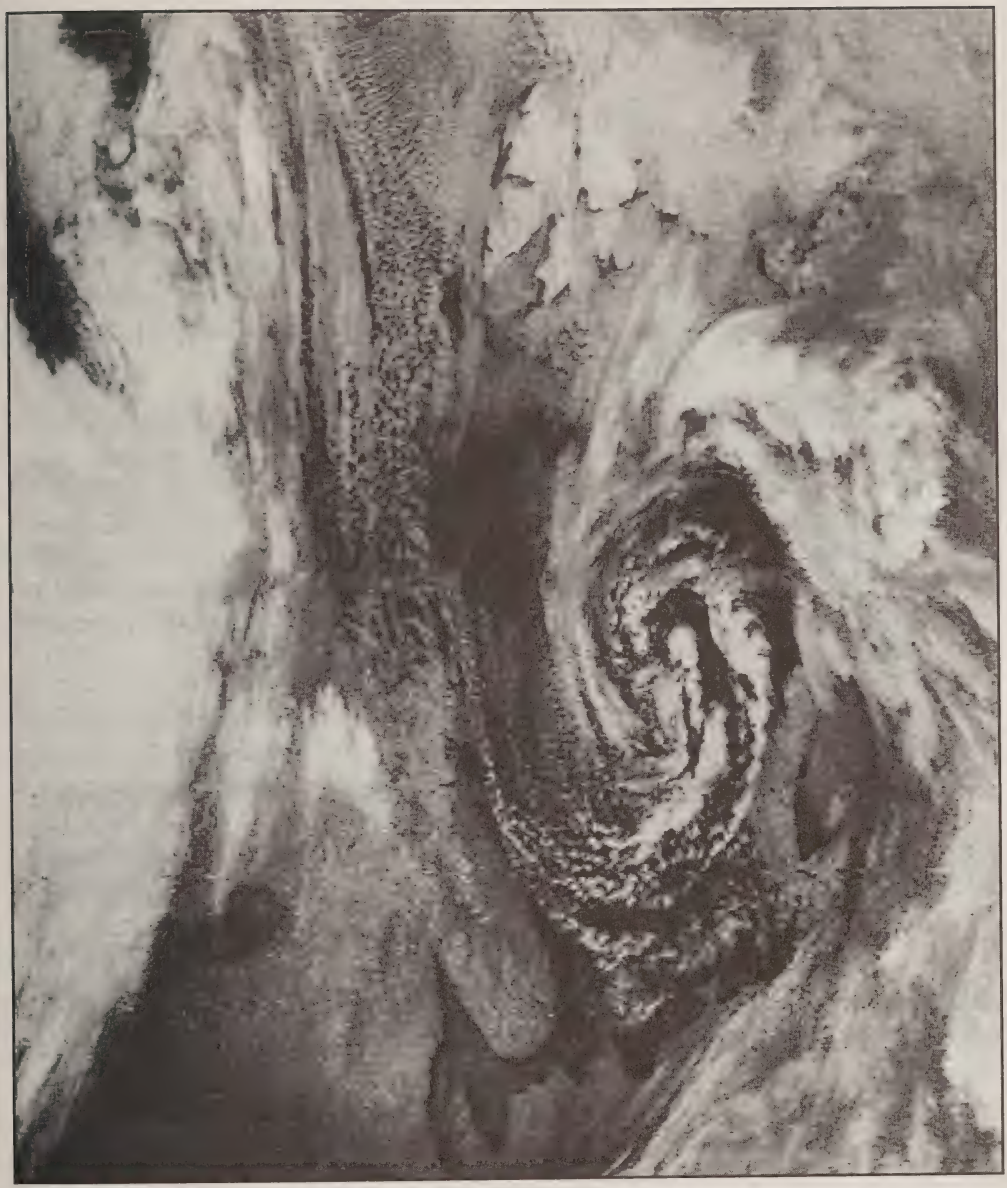
Following in the erratic footsteps of its forebears, Okean 4 continues to weave its unpredictable way through the heavens. But when you are fortunate enough to capture an image, it is usually well worth the wait. This satellite has been monitoring the White Sea, and radar images received in late March and early April have clearly shown the ice receding. On other occasions, fine images of central Russia have been obtained, with the city of Moscow, the Donets and Dnepr Basins, the Crimea and the Sea of Azov all showing up in great detail. Moscow is prominent in the accompanying image received on 9 April and the river systems of the eastern Ukraine are well defined to the south.

NOAA 10's Last Days

At the time of writing, NOAA 10 is inactive, and perhaps will never be heard from again! As reported in RIG 40, the dynamic range of its IR sensors was severely impaired during a loss in attitude control, leading to some quite weird high-contrast images. However, when travelling above the north polar regions early in 1995, NOAA 10 produced some remarkable infra-red images showing the frozen, icy wastes of northern Scandinavia, as well as the Arctic polar ice. The image shown here illustrates a small polar depression in the Barents Sea just south of ice-clad Svalbard. Frozen Finland and Novaya Zemlya also show up well on this mid-afternoon pass on 5 February this year.

Even by my standards, being situated at latitude 57N in the north-east of Scotland, reception was unusually clear on that day, and images from so far to the north-east of Europe of this quality are exceptional. Even so, there were two prominent interference bands in the original image, and I am indebted to CG Roberts for the time he spent "invisibly mending" it. ⊕





NOAA 10 5 February 1995 Barents Sea

FOR SALE. Timestep PROscan receiver 4.1 including power supply and preamplifier. As new and in perfect order. £125 ono. Tel Jonathan on 01492 583052 evenings or Email ampyx@cix.compulink.co.uk.

A YAGI FOR METEOSAT RECEPTION

Jaap Rusticus PA0JRK

[This article was also submitted to Weather Sat Ink and appeared in the 1994, 2nd quarter issue. Ed]

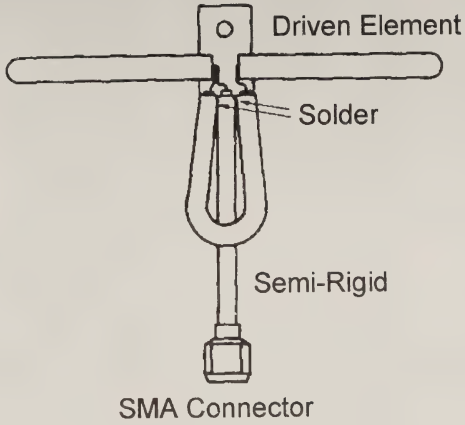
A few years ago I thought, that it would be nice to look at the images from Meteosat during holiday trips. The antenna needed for this should be of simple construction; it could be a loop-Yagi, but I was not happy about the mechanical construction. A portable antenna must be able to cope with rough handling and a loop-Yagi would be susceptible to damage during transport by car.

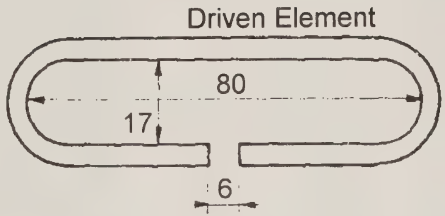
What can be achieved with a loop-Yagi must also be possible with a normal Yagi. In a German amateur magazine called "UKW-berichte" I found a description about the building of long Yagis. Based on this article, written by Gunter Hoch (DL6WU), I calculated the dimensions for a Meteosat Yagi of about one metre (3 1/3 feet) long. The boom I used for this antenna is 15 x 15mm aluminium tubing and the elements are made from 4mm stainless steel rod. The Yagi is a very normal one, with one reflector, one driven element and 16 directors. According to the article it is best that the lengths of the directors are decreasing exponentially.

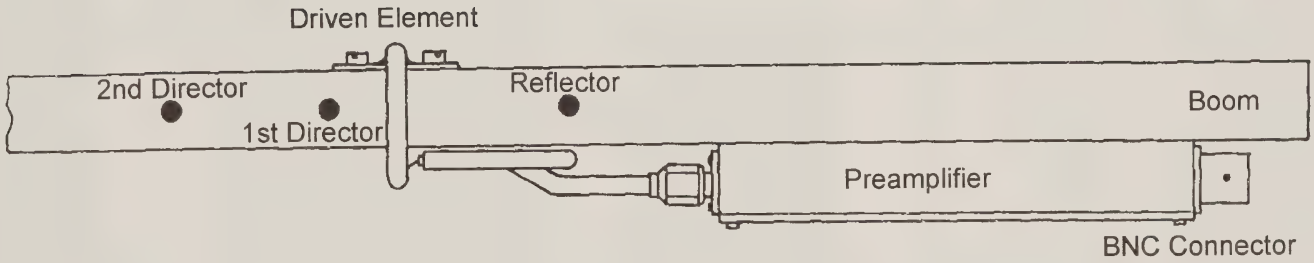
The lengths of the elements come from a table but two-thirds of the boom diameter should be added to this length. The driven element is a folded-dipole matched to the preamplifier by a balun made from 50 ohm semi-rigid coaxial cable. During reception I am holding the antenna at the rear end of the boom which extends some 15cm behind the reflector. On this end of the boom I mounted the preamp (1 gaasfet and 2 mar-6s) with the size 14 x 14 x 97 mm. At the end of the preamp is a BNC connector.

The holes in the boom were drilled with a 3.9mm bit. The elements were pressed through the holes with a vice. You can find the size of the driven element and the semi-rigid balun in the drawing. This antenna has been made for holiday use and when receiving Meteosat, the signal-to-noise ratio is about 11 dB, which is sufficient when used with a good preamplifier and a good receiver (crystal filter and PLL demodulator) to produce a spike-free picture. Of course there is a very small amount of backround noise in the image but for a holiday system it is hardly worth mentioning. When you want to use a Yagi for home use, make one of 2 metres.

A good preamplifier would be the RIG one. At this moment I am designing a pcb for a new 8 x 15cm single board, single layer Meteosat receiver. Perhaps I shall write a description of this receiver in another article. For picture display I use a conventional YU3UMV framestore and a 2 x 3cm monitor screen of an old TV camera. Cabinet size is about 25 x 7 x 20cm.


Driven Element
Solder
Semi-Rigid
SMA Connector


Driven Element
80
17
6


Driven Element
2nd Director
1st Director
Reflector
Boom
Preamplifier
BNC Connector

Here are the element lengths and spacings for the Meteosat Yagi. Accuracy for the element length is about 0.5 mm and for the element spacing about 1 mm. I made the calculations for a length up to two meters, but my own antenna is 1.085 meter long. Element length is including two-thirds (2/3) of the boom diameter.

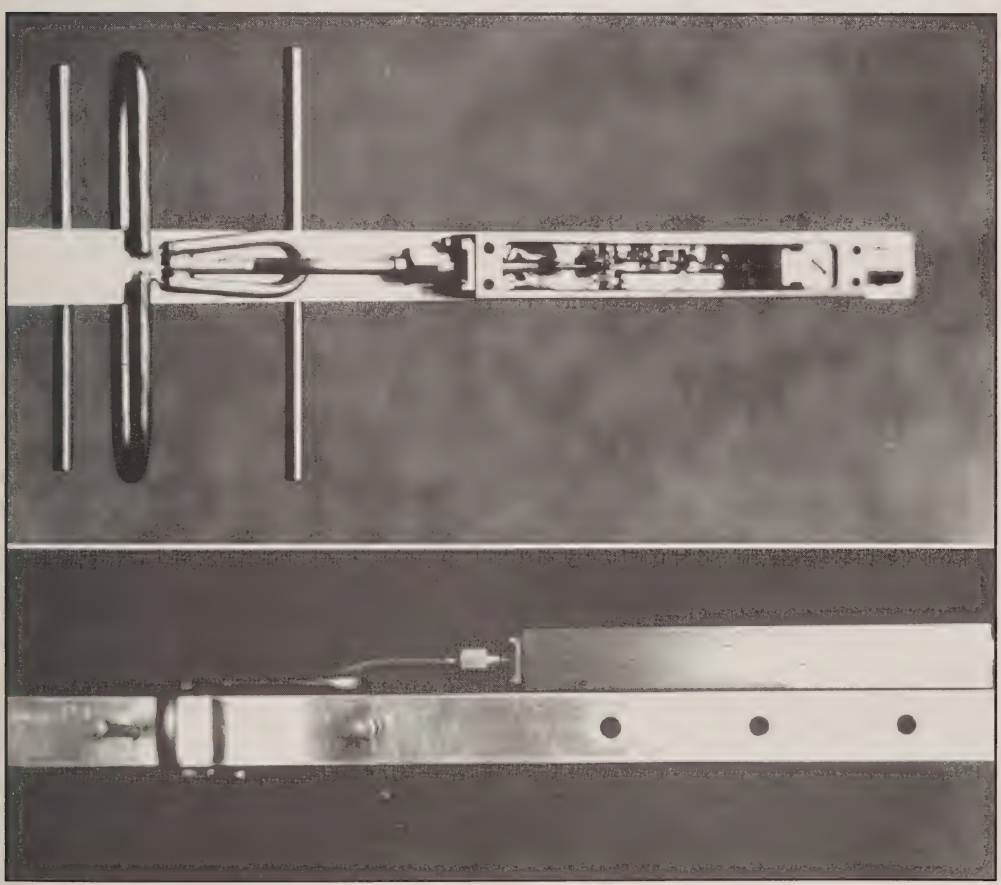
Element	Length (mm)	Distance to reflector (mm)	Gain in dB versus dipole
Reflector	92.3	0	
Driven element	86.3	35	
Director 1	82.0	49	
2	80.5	81	
3	79.4	120	
4	78.4	164	
5	77.3	214	
6	76.5	267	
7	75.8	323	11.3
8	75.2	381	11.7
9	74.7	442	12.2
10	74.2	505	12.6
11	73.8	572	13.0
12	73.4	640	13.4
13	73.0	711	13.8
14	72.6	781	14.1
15	72.3	852	14.4
16	72.0	922	14.7
17	71.7	992	15.0
18	71.4	1062	15.2
19	71.2	1132	15.4
20	71.0	1202	15.6
21	70.8	1272	15.8
22	70.6	1342	16.0
23	70.2	1412	16.2
24	70.0	1482	16.4
25	69.9	1552	16.5
26	69.7	1622	16.7
27	69.5	1692	16.8
28	69.4	1762	16.9
29	69.3	1832	17.0
30	69.2	1902	17.2
31	69.1	1972	17.3
		2500	18.1
		3000	18.7

Boom: 15 X 15 mm aluminum tubing
Elements: 4 mm stainless steel rod
Driven element: 4.5 mm tinned copper (thickness not critical)

If you want to use any other boom diameter subtract 10mm (2/3 of 15mm) from the element lengths and add two-thirds of the new boom diameter. Element thickness is not very critical. The elements should have good electrical contact on both sides of the boom.

I hope that amateurs who build a Yagi like this receive good pictures with it. Please let me know of your results. Jaap Rusticus, PA0JRK, Rohelsterweg 6, 9285 XB Buitenpost, Netherlands. Tel +31 511542637

Literature: 1. Hoch G., DL6WU: Extreme long Yagi antennas. UKW-Berichte 1982 / first quarter, page 3-11.



2. Schaumburg A., DF7ZW: Reception of Meteosat with Yagis. UKW-Berichte 1987 / third quarter, page 177-180. The table in this article is incorrect, see 3.

3. Ultra-kurz, UKW-Berichte 1988 / first quarter, page 60-61. Herein is the correct table. ⊕

FURTHER NOTES ON TEC 200 IMAGE FILM

Graham Smith G1JVZ

Recently I had to make a double-sided board for a computer expansion project. As it was complicated, I decided to use TEC 200 image film (see RIG 40) even though no instructions on double siding are given in the manufacturer's literature. On the first attempt I ironed down the tracks on one side, then ironed down the second side and it melted the tracks on the first side. Eventually I came up with a reliable and easy method as follows:

1. Drill the component holes in the board to help line up the artwork on both sides.

2. Iron down the tracks on one side.

3. Cover the other side of the board completely with a large sticky paper label.

4. Etch the board and rinse but don't take off the resist yet.

5. Peel the label off and thoroughly clean the second side (this may take a lot of doing - I had to use steel wool).

6. Iron down the tracks on the second side.

7. Put a sticky label on the first side to protect it.

8. Etch the second side, rinse the board, remove the label and clean etch resist off both sides with nail varnish remover.

No doubt there is a way to do both sides simultaneously but it would require much more skill than my easy method. Don't forget that boards done this way don't have plated-through holes when you're soldering components in.

ERRATUM. The first line on page 31 of RIG 40 should read "hand held image scanner..." ⊕

A PRACTICAL BEGINNERS' GUIDE (1)

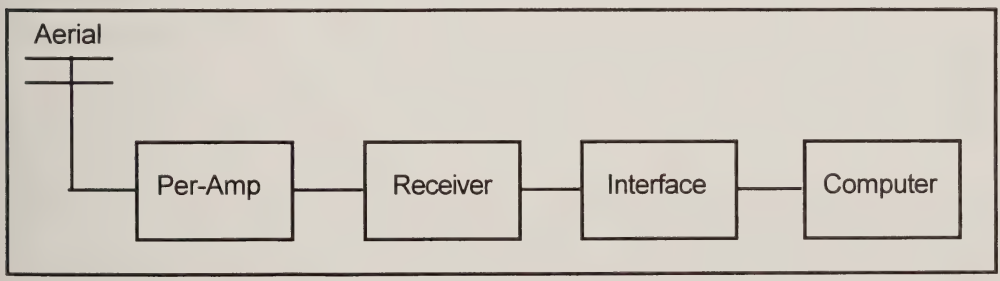
Humphrey Berridge

This article comes as a response to pleas expressed in the comments returned by members renewing membership of RIG last year: If you don't know your PDUS from your elbow, how do you start?

Fortunately, the answer is that it is very easy to set up a system and get good quality pictures - and it does not have to cost vast sums of money or require your roof to be strengthened. Once you have it all working, you can immediately get involved in interpreting pictures in visible or infra-red light, at different seasons of the year, and in understanding orbits and predicting when satellites will be within range. Once hooked, there are plenty of other avenues to explore, depending upon the depth of the pocket!

You may well already have the most essential bit of equipment - a computer. This is necessary because it can both run programs to predict orbits and can also display your pictures. It does not have to be a mega-fast and powerful machine - ideally a 386PC with 4Mb of RAM, although you could even use a 286 provided that it runs its monitor in VGA graphics. You will also find, as you become enthusiastic, that pictures take up a large amount of hard disk space, so you will need a few Mb clear for at least temporary storage (one pass of a NOAA satellite receiving both visible and infra-red takes about 2Mb!). You may, of course, also expect to be able to print out your pictures - in general, the better your printer, the better the pictures you can expect but very acceptable results can be obtained with a Deskjet at 300 dots per inch. One snag: other uses of your computer such as word processing will tend to take a back seat whilst satellites are within range...

You now need four pieces of hardware and one piece of software: an aerial, a pre-amplifier, a receiver, an interface, and the JVFAX software (free!) which has often been enthusiastically described in this journal.



Unless you are an expert, do not expect to build the equipment yourself because constructing electronics for operation at high frequencies is not easy. However, some

construction may be necessary requiring soldering and mounting pre-built modules into boxes. This can be fun and allows some customisation for your own requirements. Much of what you need is advertised in the RIG Journal and other bits and pieces are available on mail order from electronics suppliers - Maplin, for example, have a very extensive catalogue and can provide components from stock.

THE AERIAL

You do not need expensive aerials to receive polar orbiting satellites - a 'turnstile' aerial mounted on the roof will work extremely well. It is worth bearing in mind that VHF signals (in our case at about 137MHz) are in general 'line of sight', so the requirement is for the aerial to 'see' as much horizon as possible - this is much more important than just height, and I have had excellent results with a turnstile only 2m off the ground in a clear area. These types of aerials have their maximum gain at about 20 to 30 degrees above the horizon, where the satellite is furthest away, so in the UK on a good pass you can expect to receive the satellite from North Africa to the Arctic Circle. The RIG crossed dipole aerial available from Shop Corner is very easy to assemble, being held together with wing-nuts; read the instructions very carefully, though, and make sure you assemble it exactly as in the diagram, and with the 'phasing cable' cut as accurately to length as possible. Aerial clamps and masts are available from local TV suppliers or companies such as Maplin.

THE VHF PREAMPLIFIER

The Crystal Palace TV transmitter radiates power at around 1000kW and covers approximately the London area; we are trying to receive a satellite anything up to 3000km away, radiating only a few watts of power! This means that we must not waste any of the energy we are collecting with the aerial and as soon as possible, it must be amplified before it is sent down the feeder cable to the receiver. The RIG VHF pre-amp is designed to do precisely this job and it should be mounted immediately below the aerial by taping it on to the mast. It will require boxing, and the conductive plastic box suggested in the instructions is an ideal way to do it - the box must be made from conductive plastic or metal to make a radio frequency (r.f.) screen around the pre-amp, as well as keeping the water out.

Hints:

Water is bad news to all electrics, and especially at rf. Do not use the cheap, air-spaced coax cable often used for TV downleads and do not use TV-type connectors on the pre-amp box. A little more money spent here on good cable (UR-43) and on waterproof connectors (50 ohm N-type) will prove well worth it. Also, use PVC tape to seal all around the box and connectors just to make sure.

The pre-amp is best powered down the coax cable (it requires a 12V supply), because this means only one long cable from the roof. Most receivers have the facility to supply the power in this way. It sounds obvious but before you screw the lid on the pre-amp box, mark on the outside of the box which connector goes to the input (aerial) and which the output (receiver) - this could save embarrassment later!

THE VHF RECEIVER

This is the most expensive piece of hardware you will need to purchase and it should be specifically designed for satellite use - i.e. it should be able to receive the small number of channels used between 137 and 138 MHz and be able to track the shift in frequency caused by the Döppler effect - orbiting satellites have extremely high speeds and, as they approach, they squash the waves ahead of them producing a slightly higher frequency and, as they go away, they stretch the radio waves giving a slightly lower frequency. Good receivers also have good filtering which helps to reduce the effects of interference from other sources. It is desirable, but by no means essential, to have a scanning facility - this allows the receiver to scan the satellite channels repetitively until a signal is found, or to be held on a specific channel. It can also be reassuring to have an S-meter, showing the strength of the received signal but this is not absolutely essential.

You can either decide to buy a complete receiver from one of the advertisers, or if you want to 'customise' your own, you could purchase the 'Dartcom' receiver module from RIG. In the latter case, you must mount it in a metal box (rf screening again) and you will need to work out for yourself what connectors and facilities you wish to add.

Hints:

a) Make your 12V power supply have a larger current rating than you think you will need; at least 1A. It will have to power the receiver, pre-amp, and interface, and later on you may want to add Meteosat converter, switching relays, etc. If it is in the same box as the receiver, use a 'torroidal' type of mains transformer which radiates less magnetic field than conventional designs.

b) If you are using the Dartcom receiver, use an ON-OFF-(ON) miniature toggle switch for the scanning control - i.e. one which has a sprung position on one side. This makes it easy to have the switch on 'scan' or 'hold', and a quick push allows you to 'skip' a channel being received.

c) Put a connector on the back of your receiver box to take power (12V) to the interface. Suitable power connectors are available from electronics suppliers. Use a phono connector to take the receiver output to the interface.

d) For those who have not come across the term before, a 'Squelch' control on the receiver allows you to set the signal level at which the audio to the loudspeaker and output is turned on. Thus, if no radio signal is being received, the noisy hiss is switched off. This is usually used by the scanning circuitry of your receiver to decide whether to jump from channel to channel or to hold where there is a signal (more sophisticated receivers actually look for the characteristic 2.4kHz tone of the satellites to operate the squelch).

THE INTERFACE

The Martelec JVFAX Interface is a good buy - special prices from the RIG shop. It is probably worth buying the cable to connect to the serial port of your computer at the same time. You do not need any special cards or modifications to your computer because the unit just plugs into your serial port. You will also need to make up a power lead for the interface from the receiver and a phono lead of the same length to carry the signal.

Note: Early JVFAX Interfaces had non-standard serial leads which had to be specially made, but more recent editions have been modified for standard leads.

THE SOFTWARE

When you buy the interface, you also get the free software. Print out all 51 pages of the documentation - it is well worth it! The program will need to be configured the first time you use it and help for this is available (rather briefly) in the Martelec instructions and in previous articles in the RIG Journal.

Check that all is working by changing Modes on the software from NOAA to Meteosat, and see that the green LEDs on the interface skip from AM1 to AM2 position. With the squelch 'open' and the receiver making noises, check that the red LEDs on the interface light up and that the histogram display on the computer screen shows the variation from black to white. You should reassure yourself that the interface and computer are talking to each other.

LISTENING

Once you have your receiving system set up, you will be anxious to hear satellites. Be warned: once you hear the distinctive 'tick-tock' of a satellite, you'll be hooked! Turn down the 'squelch' control on your receiver and make sure that you get lively and enthusiastic noises out of the loudspeaker. Turn the squelch back up until the noise just cuts out.

If you have a scanning system, you could just wait to hear something - or you could monitor a particular frequency (the NOAA channels on 137.62 and 137.50MHz are good places to start, especially around the middle of the day). Better still, use the predictions published in this Journal, or run a prediction program on your computer to tell you when to expect satellite passes.

THE PREDICTIONS

When you first start, use very simple prediction programs which print out all you need to know - big graphics programs like Bird Dog and PC Track will be fun later. You can get programs via RIG shareware or download them from the bulletin board if you have a modem. Les Hamilton's excellent little program 'AOSTIME' is terrific and predicts to the minute when you can expect to receive a particular satellite. A good way to impress spectators.

Hints:

a) Prediction programs are only as accurate as their data - you do not need to understand orbit mathematics but you do need to update regularly the 'Kepler Elements' or 'NASA Twoline' data associated with the program. You can do this from this trusty journal, or again if you are lazy you can download the data from the bulletin board.

b) A piece of jargon associated with predictions is 'EQX' which means 'equator crossing' longitude for that particular orbit. It is really useful to know that if the EQX is close to 0 or 360 degrees, the satellite on this orbit is travelling S-N across Europe and

Fig 1.

if it is around 180 degrees, the satellite is travelling N-S. This helps in selecting the right mode with the JVFAX software, and therefore getting a recognisable picture.

c) Satellites may be switched off. Satellites may change transmitting frequencies. Russian satellites, in particular, are elusive, and may only be switched on when over Russia, or indeed, not at all. Your equipment may not be at fault if the satellite does not materialise! On the other hand, maybe you've forgotten to plug in the aerial.

d) If you have a modem, turn it off when receiving satellites - it may interfere.

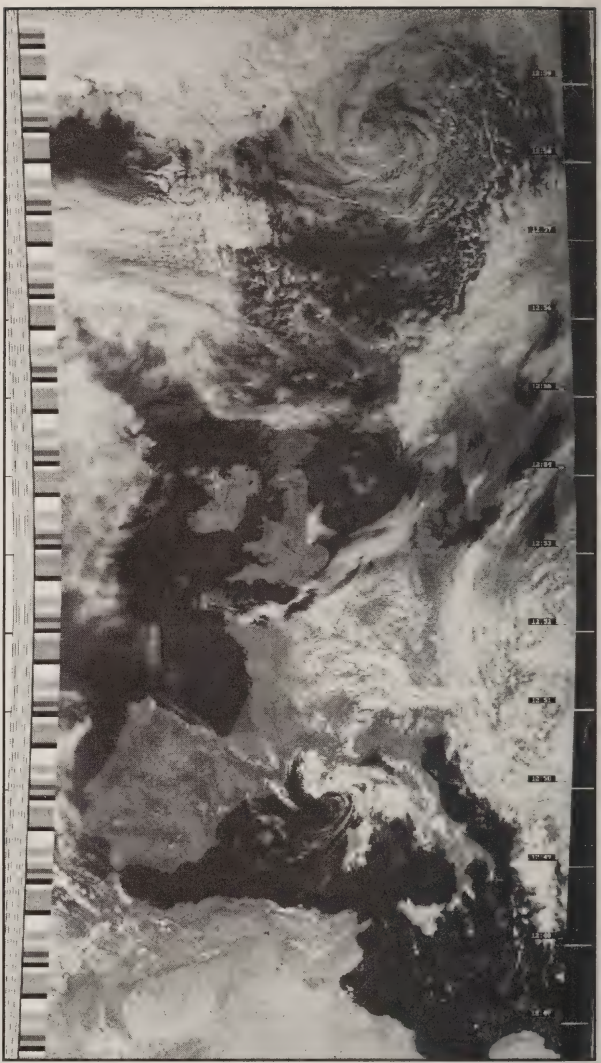


Fig. 2

IMAGES

Once you are receiving satellite signals, you will want to decode them into images on your computer screen. This is where you will have to play with the JVFAX software. Remember to set up the gain control on the interface so that the histogram display on screen just hits the peak white - this will give the best contrast and should ensure quite reliable triggering. It is a good idea to start with the NOAA satellites and to capture the full scan 'NOAALL' modes so that you can see the two pictures (visible and IR) side by side. Then go for visible light pictures which have a higher resolution and will give more recognisable coastlines etc.

Fig 1. shows what you will probably get first time. Do not be depressed - if you can see areas of light and dark, you have an image. Very minor tinkering will get you a masterpiece.

Here there are three things wrong:

a) The picture slopes because you need to synchronise the clock speed of the computer to the incoming lines of the picture. Solution: The '/' command.

b) The picture is not locked at the edge to produce a frame across the screen. Solution: If it does not cure itself, try (gently) changing the squelch settings on the 'Misc. settings' screen of JVFAX.

c) The picture has lost lock in the middle, and slipped horizontally. I pressed the 'A' key by mistake.

There are also bands of noise because this was not a close pass and it was thus more prone to interference.

Get it right and the result is Fig. 2.
Time to get the Atlas out.

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COMET IMPACT IMAGES MOST POPULAR ON INTERNET

The number of accesses to the Comet Shoemaker-Levy Internet home page at JPL topped the 4 million mark during April. The comet impact event became the first astronomical event to be supported by global use of the Internet (see RIG 38, September 1994). During the comet impact week of 16-22 July, 1994, the Comet SL9 home page became the most accessed home page in the world with over 1.1 million accesses. The 2 million milestone was quickly surpassed in August 1994, and 3 million mark was reached in November 1994. Even though it has been almost 10 months since the comet collisions, the home page is still averaging a brisk 5,000 accesses per day.

The Comet SL9 home page is still being updated with the latest news and images on the aftermath of the comet impacts with Jupiter. With over 1,100 images, the home page has the world's largest collection of comet impact images available on the Internet.

The URL for the Comet Shoemaker-Levy home page is:

http://newproducts.jpl.nasa.gov/sl9
🌐

WEATHER SATELLITE DEVELOPMENTS

Automatic Picture Transmission from TIROS 8

CE Goodison C.Eng., MIEE

[Eric Goodison retired from the Meteorological Office a number of years ago and subsequently joined RIG. He sent me a copy of an article he wrote more than 30 years ago which I am sure many members will find interesting. It appeared in the August 1964 issue of Wireless World (since renamed Electronics World + Wireless World) and the text is reproduced here with only minor editing. Ed]

Among the new host of heavenly bodies is TIROS 8, the latest meteorological satellite to be launched by NASA, the United States' space organisation. It is one of the weather observing satellites in the Television and Infra Red Observing Satellite series. The first TIROS orbited on April 1st 1960 and since then there have been 100,000 cloud cover pictures taken by TIROS-type satellites.

These pictures are taken by a TV camera, which is scanned and the picture information stored on a tape recorder, before the camera is used again. The tape storage capacity is 32 complete pictures and there is a 30 second interval between each picture. When TIROS is over one of the Control and Data Aquisition Stations in North America, the stored pictures are rapidly read out by the ground station. The pictures are then sent through meteorological channels to weather services throughout the world.

Due to certain constraints[1] (of which the principle are:-(1) orbit latitude limits (normally 58N to 58S), (2) illumination of territory passed over, (3) tape storage capacity, (4) geographical situation of read-out stations - North America) the pictures obtained do not provide world-wide cover with any regularity. Pictures of interest to meteorologists in the UK may only be available after a delay of up to 24 hours.

The Forecaster at Meteorological Office HQ works to a strict timetable and has to meet several deadlines throughout his working day. These deadlines vary from issuing BBC radio forecasts at specific hours, to briefing aircrews who must take off at regular times. These various forecasts are based on synoptic charts drawn up every 6 hours throughout the day.

It is obvious then that to be really useful as a meteorological aid cloud pictures of the surrounding area should be as regular and as reliable as possible and in the forecaster's hands with the minimum of delay.

It is with the aim of reducing these delays that APT (Automatic Picture Transmission) has been installed experimentally on TIROS 8 so that an operational assessment

could be made of its capability of delivering to any forecaster in the world with suitable receiving equipment "instant" cloud pictures of the surrounding area, which may be up to a half million square miles, within three minutes of the picture being shot. The orbit of TIROS 8 does not give the regularity of observations required but this will be obtained later when a new type of weather satellite is sent up on a circumpolar orbit.

TIROS 8 orbits in about 100 minutes at an altitude of about 470 miles. At this height the APT camera takes square pictures with a side of 700 miles when the camera is pointing vertically. Of course, verticality in space is meaningless; in the context of the APT camera the local vertical is meant. This condition cannot occur more than once per orbit since TIROS is a spin-stabilised satellite, the axis of which remains at a fixed angle to the earth's axis throughout its orbit. This angle can be changed by the elegant expedient of passing a current through a hoop around the satellite. The magnetic field caused in this way interacts with that of the earth and the angle of the satellite is changed.

The camera shutter is open for 40 milliseconds, which is short enough to cause minimal blurring of the picture, although the satellite is travelling at around 16,000 miles per hour. After exposure the read-out time lasts for 200 seconds during which time the vidicon tube of the APT camera is scanned at 4 lines per second. Since the APT equipment on TIROS 8 is an experimental installation there is a timing sequence which allows the take/read-out cycle to repeat about 10 times, ie for half an hour, when commanded by a NASA ground station. The output from the vidicon frequency modulates a 136.95Mc/s, 5 Watt transmitter and this signal is radiated by the satellite. The frequency deviation is +/- 10 kc/s.

The ground station which is necessary to receive these facsimile type transmissions is of a comparatively simple type. In fact, its simplicity is is the great merit of this meteorological satellite system.

When the satellite rises and sets the distance between the transmitter and receiver is at a maximum, 3,000 kilometres. At this range using a frequency of 137Mc/s, a receiver with a noise factor of about 5 or 6 dB, and an aerial with a gain of 10dB will deliver a useable signal. The amplitude modulated sub-carrier of 2,400 c/s is fed to a specially designed recorder. There are several proprietary models of this recorder being produced and "packaged" complete ground stations have been produced by NASA and installed at various sites throughout the world. The US base at High Wycombe is equipped with one of these stations. The British Meteorological Office is constructing its own station at Bracknell.

The most popular type of aerial used to give the necessary gain without recourse to a narrow beam response is the helical array used in the axial mode. An 8-turn helix,

with a diameter of 27.5 inches and 21 inches between turns gives[2] a beam width of 35 degrees between half-power points and a gain of 13dB. With such an aerial accurate tracking is not required and most aerial pedestals, although remotely controlled, are positioned manually. The Meteorological Office plan to use in their prototype station an aerial mount originally designed for use with an early AA radar. This aerial when used operationally was aligned by the auto-follow circuits attached to the radar, but in the first model the APT Ground Station aerial will be manually controlled. Later models may have a programming unit in the control so that the satellite may be tracked automatically from orbital data supplied by NASA.

The receiver used by most American stations is a very sophisticated space telemetry set with phase-lock-loop detection and many other exotic features. The Meteorological Office will be using a British-built commercial communications receiver with a pre-amplifier designed by RRE, Malvern.

The facsimile recorder which will be used is a Muirhead D 900S which operates at 240 lines per minute. It will start automatically on receipt of a "start" signal signal from the satellite and after 200 seconds a square picture of 800 lines measuring 9in x 9in will be completed. As stated earlier, the equivalent side of the picture is 700 miles and it is interesting to note that, although the vidicon in the satellite camera is only one inch in diameter, the resolution at the centre of the picture is said to be about 2 miles.

Initial experiments were carried out in collaboration with RRE, Malvern and Muirhead of Beckenham and APT pictures were received on the first few orbits of TIROS 8. These pictures were only of a limited usefulness since they were marred by an overall scallop pattern which was caused by malfunctioning of a circuit in the satellite electronics. This type of interference is present on all TIROS 8 APT pictures although the American Weather Bureau were able to use photographs which showed cloud cover and easily recognizable geographical features such as Lake Huron. Until now the pictures taken over Western Europe have produced no distinctive coastlines or landmarks since the camera angle has always been such as to photograph the Atlantic or Sahara.

When APT becomes fully operational it will prove a useful addition to the way in which electronics is helping the weather forecaster. ⊕

References

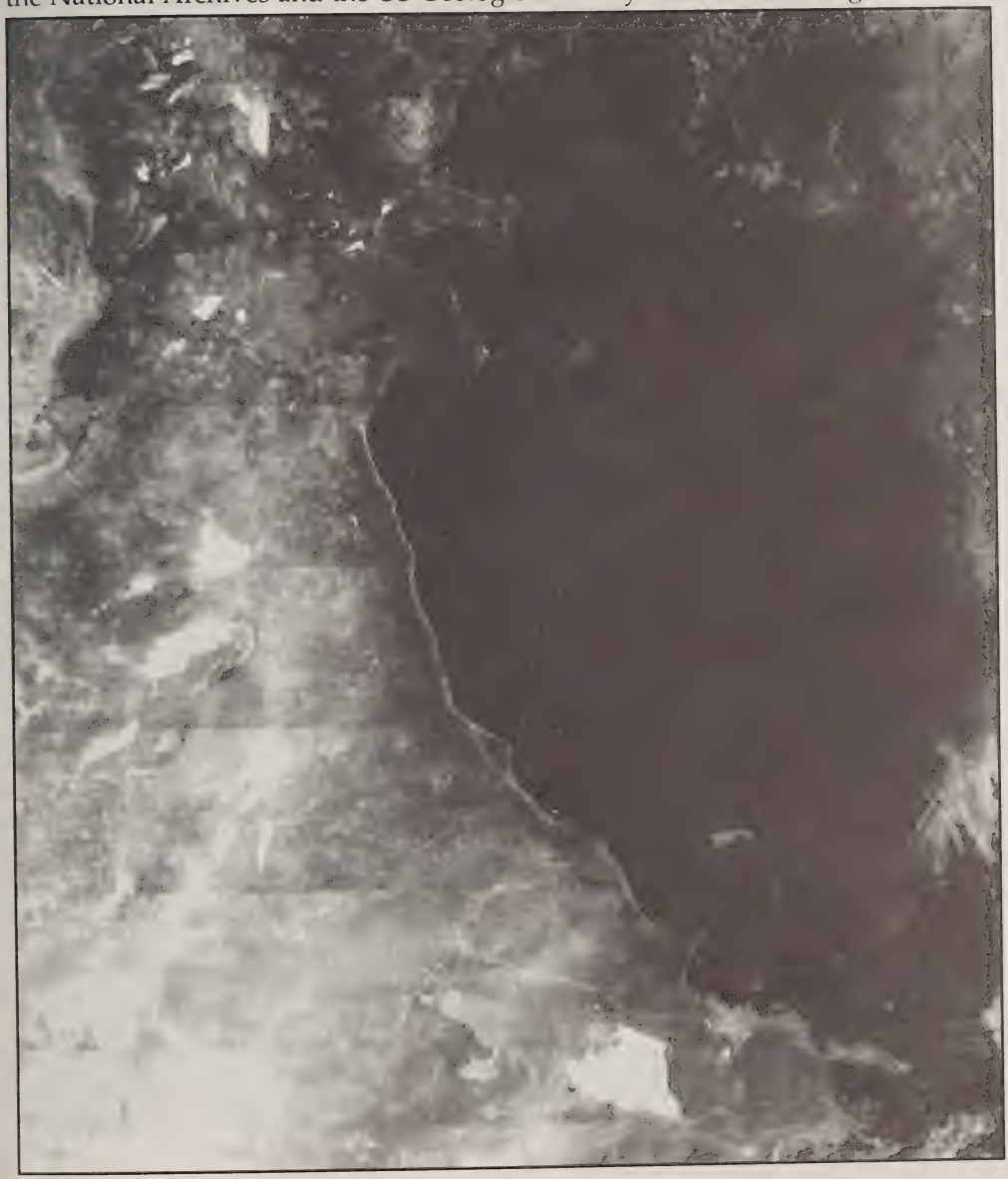
1 "An Explanation of the Limitations to the Coverage provided by TIROS," by WK Widger Jr and CP Wood. Weatherwise, Dec 1961, p 230.

2 "Antennas," by JD Kraus. (McGraw-Hill.)

RECONNAISSANCE SATELLITE IMAGES RELEASED

Peter Wakelin

On 24 February the United States released the first of 886,000 images obtained from reconaissance satellites which are to be made public over the next 18 months through the National Archives and the US Geological Survey. Most of the images resulted



Aral sea on 29 August 1962

Military airfield near Dolon in Kazakhstan.

PREDICTED TIMES FOR AQUISITION OF SIGNAL FOR 52.5 DEG NORTH, ZERO DEG EAST

	NOAA 9 Period 101.91 mins 137.62MHz				NOAA 12 Period 101.28 mins 137.50MHz				NOAA 14 Period 102.07 mins 137.62MHz				OKEAN 4 Period 97.75 mins 137.40MHz			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
10 Jun	0929	1110	1921	2101	0733	0913	1721	1901	0049	0229	1221	1403	0826	1004	2011	2149
11	0917	1057	1908	2048	0711	0852	1659	1838	0218	0400	1211	1352	0853	1031	1859	2037
12	0904	1044	1856	2035	0650	0830	1639	1817	0207	0349	1200	1341	0918	1058	1925	2103
13	0851	1031	2022	2204	0629	0807	1755	1936	0156	0338	1149	1330	0807	0945	1952	2130
14	0838	1018	2009	2150	0746	0927	1734	1914	0145	0327	1139	1319	0834	1012	1840	2018
15	1005	1146	1957	2137	0724	0904	1712	1852	0134	0316	1128	1308	0900	1039	1907	2045
16	0952	1133	1943	2124	0703	0843	1651	1830	0124	0305	1117	1257	0747	0926	1933	2112
17	0938	1120	1930	2111	0641	0821	1808	1949	0113	0254	1107	1246	0814	0953	1822	2000
18	0926	1107	1917	2058	0619	0758	1747	1928	0102	0243	1235	1417	0841	1020	1848	2026
19	0914	1054	1905	2045	0737	0918	1725	1905	0052	0232	1225	1406	0729	0908	1736	1914
20	0901	1041	1853	2032	0715	0856	1704	1844	0221	0403	1214	1355	0756	0935	1803	1941
21	0848	1027	2019	2200	0654	0834	1643	1821	0211	0352	1203	1345	0648	0823	1830	2008
22	0835	1014	2006	2147	0632	0812	1759	1940	0200	0341	1152	1333	0715	0849	1716	1856
23	1002	1142	1953	2134	0610	0750	1738	1919	0149	0331	1142	1322	0738	0916	1744	1923
24	0948	1129	1940	2121	0728	0909	1717	1857	0139	0320	1131	1311	0629	0804	1811	1949
25	0936	1116	1927	2107	0707	0847	1655	1834	0128	0309	1120	1301	0653	0831	1659	1837
26	0923	1103	1914	2054	0645	0825	1634	1813	0117	0258	1110	1250	0719	0857	1726	1904
27	0910	1051	1902	2041	0624	0803	1751	1832	0108	0247	1238	1420	0745	0925	1752	1930
28	0856	1037	2028	2210	0741	0922	1729	1910	0056	0236	1228	1410	0635	0812	1641	1819
29	0843	1024	2015	2157	0720	0901	1708	1848	0225	0407	1218	1359	0701	0839	1707	1845
30	0830	1011	2002	2143	0659	0838	1647	1826	0214	0356	1207	1348	0550	0727	1733	1912
01 Jul	0957	1139	1969	2130	0637	0817	1804	1945	0203	0344	1156	1337	0616	0753	1622	1800

	NOAA 9				NOAA 12				NOAA 14				OKEAN 4			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
02 Jul	0945	1126	1937	2117	0615	0754	1742	1923	0153	0334	1145	1326	0641	0820	1648	1826
03	0933	1113	1924	2104	0733	0914	1721	1901	0143	0323	1135	1315	0530	0708	1537	1714
04	0920	1100	1911	2051	0711	0852	1700	1839	0132	0312	1124	1304	0557	0735	1603	1741
05	0907	1047	1859	2038	0649	0830	1638	1817	0121	0301	1113	1254	0623	0802	1629	1807
06	0854	1034	2024	2207	0627	0808	1755	1936	0110	0250	1242	1425	0511	0649	1518	1655
07	0841	1021	2012	2153	0605	0745	1734	1914	0100	0239	1231	1413	0538	0716	1545	1722
08	1008	1149	1959	2140	0724	0905	1713	1852	0049	0228	1221	1403	0604	0743	1610	1749
09	0954	1136	1946	2127	0703	0843	1651	1831	0218	0359	1210	1351	0453	0631	1637	1816
10	0941	1123	1933	2114	0641	0821	1808	1950	0206	0349	1159	1341	0520	0657	1526	1704
11	0929	1110	1921	2101	0619	0759	1747	1828	0156	0337	1149	1329	0545	0724	1552	1730
12	0916	1057	1908	2047	0738	0918	1725	1905	0145	0326	1138	1319	0434	0611	1440	1618
13	0903	1043	1855	2034	0715	0857	1704	1844	0135	0315	1127	1308	0501	0638	1507	1645
14	0849	1030	2021	2203	0654	0834	1643	1823	0124	0305	1117	1257	0353	0527	1534	1712
15	1017	1158	2009	2150	0632	0812	1800	1941	0113	0254	1246	1428	0415	0553	1422	1559
16	1005	1146	1955	2136	0611	0751	1738	1919	0102	0243	1235	1416	0442	0618	1448	1626
17	0952	1132	1943	2123	0729	0910	1717	1857	0051	0232	1224	1406	0333	0508	1515	1653
18	0939	1119	1930	2110	0708	0848	1655	1735	0221	0403	1213	1355	0358	0535	1403	1541
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21	0900	1040	2031	2213	0742	0922	1730	1911	0149	0330	1142	1322	0339	0516	1344	1522
22	0846	1027	2018	2200	0721	0901	1709	1848	0139	0319	1131	1311	0405	0542	1411	1549
23	1014	1155	2005	2146	0659	0839	1647	1827	0128	0308	1121	1300	0255	0430	1436	1615
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26	0934	1116	1927	2107	0735	0914	1721	1902	0055	0235	1228	1409	0235	0412	1241	1418
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	NOAA 9				NOAA 12				NOAA 14				OKEAN 4			
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30	0843	1023	2015	2156	0606	0746	1734	1915	0152	0333	1145	1325	0243	0419	1248	1426
31	1011	1151	2002	2143	0724	0905	1713	1852	0141	0322	1134	1314	0308	0447	1314	1453
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05	0906	1046	1858	2037	0715	0857	1704	1844	0228	0408	1220	1402	0205	0343	1210	1349
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21	0859	1039	2031	2213	0629	0808	1756	1937	0116	0257	1109	1249	0057	2348	0925	1103
22	0846	1026	2017	2159	0607	0746	1735	1915	0105	0246	1237	1418	0124	0305	0952	1130

	NOAA 9				NOAA 12				NOAA 14				OKEAN 4			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
23 Aug	1014	1154	2005	2146	0725	0905	1713	1853	0054	0235	1227	1408	0011	0150	1018	1156
24	1000	1141	1951	2132	0703	0843	1651	1831	0224	0405	1216	1357	2327	2505	0906	1045
25	0948	1128	1939	2119	0641	0822	1632	1809	0212	0354	1205	1346	2352	2531	0933	1110
26	0934	1115	1925	2106	0620	0759	1748	1928	0202	0343	1155	1335	2242	2418	1005	1137
27	0921	1102	1913	2053	0738	0918	1726	1906	0151	0332	1144	1324	2309	2445	0847	1025
28	0909	1049	1900	2040	0716	0856	1704	1844	0140	0321	1134	1313	2159	2333	0914	1051
29	0855	1036	2027	2208	0655	0834	1643	1822	0129	0310	1123	1302	2224	2359	0940	1119
30	0842	1023	2014	2156	0633	0813	1801	1942	0118	0259	1112	1251	2250	2427	0828	1006
31	1009	1150	2001	2142	0611	0751	1739	1919	0108	0249	1240	1423	2140	2314	0854	1033
01 Sep	0956	1137	1948	2129	0728	0910	1717	1857	0057	0237	1230	1412	2206	2344	0922	1100
02	0943	1125	1936	2116	0707	0848	1655	1836	0046	0227	1219	1401	2232	2408	0810	0948
03	0931	1112	1922	2103	0645	0826	1634	1813	0216	0357	1208	1349	2121	2256	0836	1014
04	0918	1059	1910	2050	0624	0804	1752	1932	0205	0347	1158	1339	2146	2323	0903	1041
05	0905	1045	2037	2218	0742	0923	1731	1911	0154	0336	1147	1328	2211	2350	0751	0928
06	0852	1032	2023	2205	0720	0901	1709	1849	0144	0325	1137	1317	2102	2237	0817	0955
07	1019	1200	2011	2151	0658	0839	1647	1826	0133	0314	1126	1306	2126	2304	0843	1022
08	1006	1147	1958	2138	0637	0817	1805	1946	0122	0303	1115	1255	2152	2330	0732	0910
09	0953	1034	1945	2126	0615	0755	1743	1924	0111	0252	1105	1244	2043	2218	0759	0937
10	0940	1121	1933	2113	0733	0914	1721	1902	0101	0241	1233	1415	2108	2245	0826	1004
11	0927	1108	1919	2059	0711	0852	1700	1840	0050	0230	1223	1404	2134	2312	0714	0851
12	0915	1054	1906	2046	0649	0830	1639	1817	0219	0401	1212	1353	2159	2339	0740	0918
13	0902	1041	2033	2214	0628	0809	1756	1937	0209	0350	1201	1342	2049	2226	0628	0806
14	0849	1029	2020	2201	0606	0747	1735	1915	0157	0339	1150	1331	2114	2253	0655	0832
15	1016	1157	2007	2148	0724	0906	1713	1853	0148	0328	1140	1320	2141	2321	0721	0859
16	1002	1143	1954	2135	0702	0844	1651	1831	0137	0317	1129	1309	2030	2207	0747	0926
17	0950	1131	1942	2121	0641	0822	1630	1809	0126	0306	1118	1258	2056	2234	0635	0813

from the programme code-named CORONA which operated from August 1960 until May 1972 and collected both intelligence and mapping imagery. Other images derived from the ARGON system for mapping, which had 7 out of 12 missions successful between May 1962 and August 1964, and LANYARD which flew just one successful higher resolution mission in 1963. Images from later, more advanced spacecraft are not being being released. The first four newly declassified images were available on the Internet from the USGS within hours of the first release.

More recent reconnaissance missions beam their images down to Earth but these early ones were returned in capsules which ended their return trip by parachute. The collection now being made public comprises 2.1 million feet (640km) of film in 39,000 cans.

One of the principle uses of the images will be to establish a 1960s baseline for measuring changes such as those caused by global warming and deforestation.

The level of the Aral Sea has been falling for several decades as loss due to evaporation now greatly exceeds river inflow because of water extraction from the rivers for irrigation. The photograph shows the extent of the Aral Sea on 29 August 1962 and a comparison with recent images will allow an assessment of water level changes during the last 33 years. This image was created by scanning a 10 x 8 inch photograph made from a mosaic of 17 original images. As reproduced here the pixel size is around 400m which is greatly inferior to the original 17 images but still an improvement on HRPT images from the NOAA spacecraft.

The maximum resolution of the imagery released is about 6 feet (1.8m) and the accompanying image of a military airfield near Dolon in Kazakhstan probably has a resolution close to that value. It demonstrates the ability of the early imaging systems to distinguish between heavy bombers and transport aircraft seen on the airfield's main parking apron. ⊕

BEATING RUST ON ANTENNA MOUNTINGS

There's nothing more frustrating after climbing up on to the roof to service your antenna than to find that the securing nuts and bolts have rusted tight, necessitating a return trip to ground level to collect a hacksaw. Here's a timely tip from Alan Milton of Folkestone. As soon as you have erected your outdoor aerial, and all connections are firm, spray the nuts and bolts with Waxoyl (used in the under-body and chassis treatment of cars). This should ensure that there will be no rusting when the time comes to move or replace the aerial. ⊕

ANTARCTIC ICE SHELF BREAKS UP

Peter Wakelin

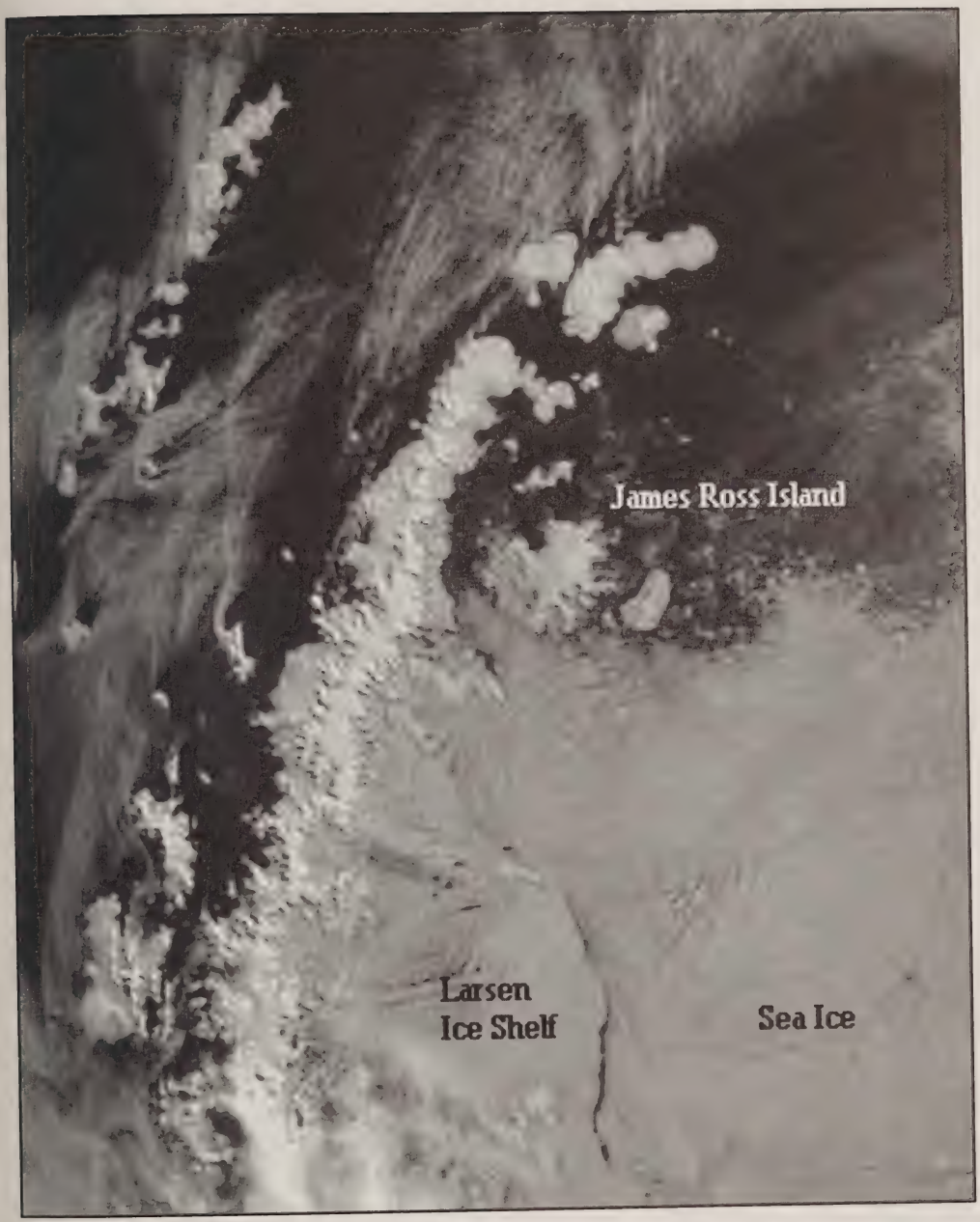
The recent southern summer brought some dramatic changes to the western edge of the Weddell Sea in Antarctica. Like the rest of the continent, vast ice shelves form along the edges as a result of the compression and spreading out of centuries of accumulated snowfall. Every year around two million million tons of ice break away to form icebergs but a similar mass falls as snow on the continent. Most of the bergs are small but from time to time huge chunks break off to form tabular bergs sometimes over 100km across and several hundreds of metres thick.

Three huge bergs were created in the Weddell Sea in 1986 (see RIG 11, December 1987, for a Meteor 2-15 image) when a large part of the Filchner Ice Shelf broke off and more recently the Wordie Ice Shelf, on the western side of the Antarctic peninsula to the south of Adelaide Island, disintegrated.

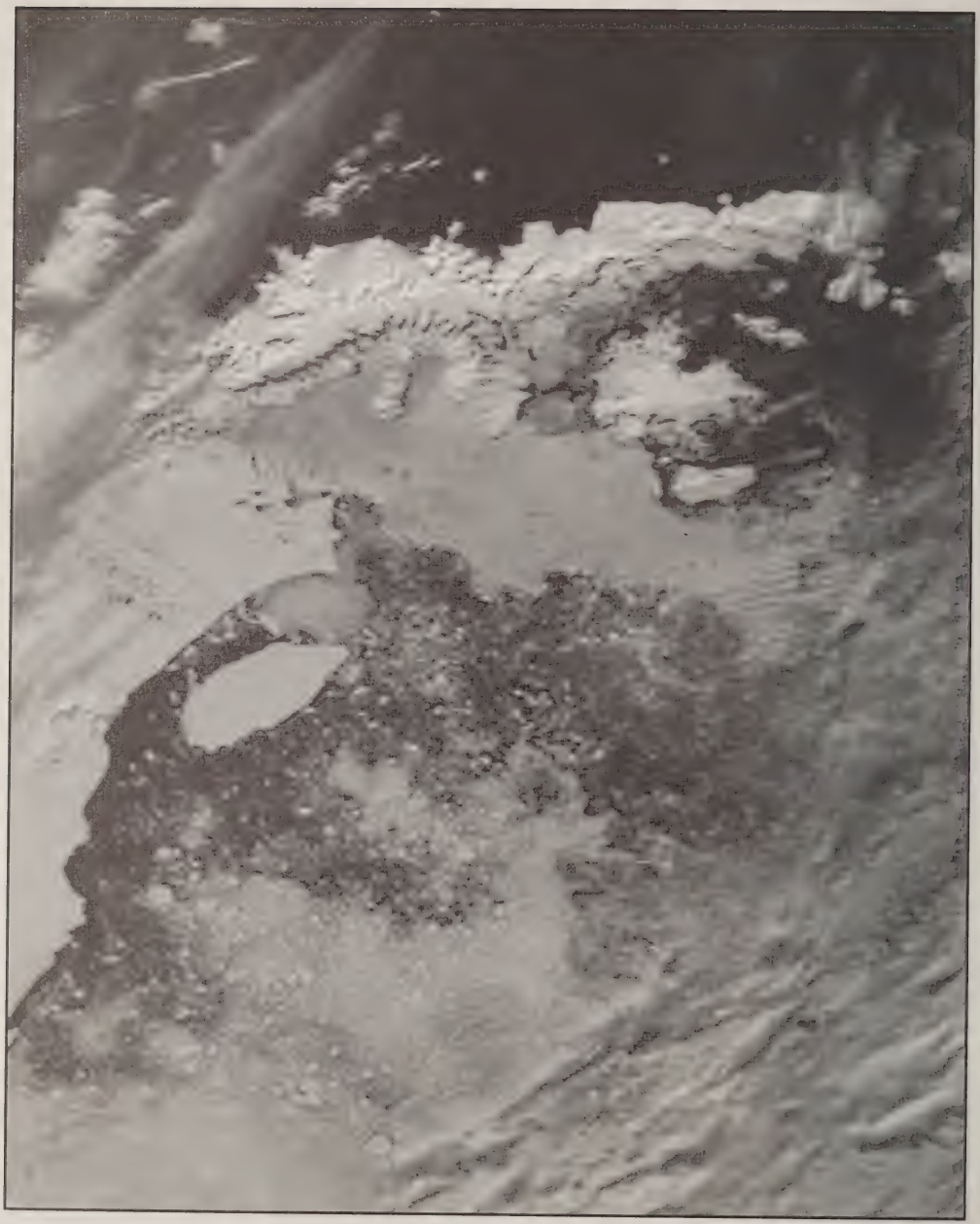
Satellite imagery received at the British Antarctic Survey's Rothera research station (situated at 67.6S 68.1W on Adelaide Island) and relayed to BAS headquarters in Cambridge, showed that some 700 square kilometres of the northern end of the Larsen Ice Shelf in Prince Gustav Channel had disintegrated resulting in James Ross Island being circumnavigable for the first time in recorded history. Later images showed that a large piece measuring about 78 x 37km had broken off the Larsen Ice Shelf to the south of Robertson Island. (For map, see inside front cover.)

Almost inevitably this event has been linked to global warming but ice shelf disintegration is a normal part of the ice cycle on the southern ice-cap. There is no denying that the mean air temperature recorded at the Faraday station (situated at 65.2S 64.3W on Galindez Island) has risen by 2.5C since records began there in January 1947 but this does not necessarily indicate a general warming of that amount over a wide area. For logistical reasons most Antarctic bases are situated close to the sea. Liquid sea water around Antarctica is always close to freezing point but once the sea freezes over in the autumn its surface temperature plummets and the air temperatures recorded at the base cease to be representative of a coastal site. As the extent of sea ice depends on winds and currents as well as temperature and varies greatly from year to year it adds an additional complication to the interpretation of temperature records. Laser altimetry measurements from satellites will soon enable changes in ice thickness of just a fraction of a metre to be detected thus providing information about ice-sheet mass balance. Even if it is eventually shown that the ice mass is decreasing the argument will continue as there are those who believe global warming would cause greater snowfall and more ice.

On a more personal note, during a total of nearly three years in the Falkland Islands I jumped at every opportunity to fly south. I saw the South Sandwich Islands and



This image timed at 11UT 9 Jan 1995 shows that the ice shelf in Prince Gustav Channel between James Ross Island and the peninsula has broken up but the large iceberg has not yet calved.



By 27 February when this image was taken, the berg had calved and drifted about 30km northeast in the Weddell Sea Gyre, a clockwise current circulating around the Weddell Sea. Both images are from NOAA HRPT ch 2.

South Georgia several times but never thought I would get to see the "real" Antarctica. Then, just a few weeks before I was due to leave the islands for the last time I was offered a flight down the Antarctic peninsula on a mission to drop supplies to a ship at anchor off Anvers Island (64.8S 64.5W). The aircrew imposed one condition before taking me; as I had prepared the weather forecast for the route and the dropping-zone they would throw me out of the aircraft instead if bad weather prevented a successful supply-drop. I accepted the risk without asking if I would get a parachute; at those temperatures it would make little difference! With no airways, no air traffic controllers and perfect weather, it turned out to be a really breathtaking trip. I have seen many beautiful sights around the world but the remarkable atmospheric clarity and rugged, pristine scenery made that a day out I shall never forget. The front cover photograph is one of many I took.

I am grateful to British Antarctic Survey staff who kindly made these images and the map on the inside front cover available on the Internet (http://www.nerc-bas.ac.uk). 🌐

MEMBERS' ADVERTISEMENTS

Members may advertise surplus equipment etc. for sale in the Journal free of charge but subject to space being available. Advertisements should be concise and must be for goods related to RIG activities. They should be submitted to the Journal editor and not the Advertising Manager.

FOR SALE. Timestep PROscan Ver 4.1 (current) scanning satellite receiver with PROsat II software and computer interface board. Turnstile antenna with Timestep pre-amp, manual, as new. All for £250. Roland G4UKL 01326 40595 (Cornwall)

FOR SALE. Amigasat (version 2) weather satellite decoding and processing package for Amiga computers complete with manual, software and interface unit. £35 ono. Cirkit weather satellite receiver, ready built with meter and two NOAA channels. May need slight re-tuning hence £25 ono. Tel. John, 01253 594381 Blackpool.

FOR SALE. Dartcom receiver with LCD in aluminium case includes full documentation £120 inc. post and packing. Francis Greaves G7POA Southampton 01703 845295.

FOR SALE. Back issues RIG journals. 36 copies including Nos 3, 5, 6 and 7. £30 including postage. F Slater, 16 Western Avenue, Holbeach, PE12 7QD. Phone 01406 24215.

FOR SALE. PROsat II with manuals and connecting cable with the latest board. £80 plus postage. Contact G4YSE at 01373 864960 Westbury, Wilts.

PRIMARY EDUCATION?

James Brown

The September 1992 edition of RIG (No.30) contained an enthusiastic review of Timestep's (then) latest brain-child, a Primary Data User system. The author waxed lyrical about the wonders of noise-free digital data and made the prophecy that this was likely to become the new standard for geostationary satellite reception. A rash statement, as I ought to know, because I was the reviewer!

In view of the massive increase in members in the last few years, there may well be a number of new readers who immediately ask, "What is PDUS?" It's an acronym for Primary Data User Station and refers to those who can receive the HRI (High data-Rate Information) digital transmissions from the METEOSAT series of European geostationary satellites. The more common reception is of the LRI (Low data-Rate Information) transmissions which are analogue signals of the usual 2.4kHz variety. Primary, as the name suggests, is the de-luxe service. With half-hourly transmissions of the whole hemisphere and enhanced pictures of Europe, definition reaches 2.5km at the sub-satellite point on the equator for visual pictures, whilst the same stream of digital data also contains infra-red and sometimes water-vapour data. The data, being in digital form, are not subject to the small-scale fluctuations of the APT system (which shows up as noise) but produces stunning pictures of smooth, photographic quality. The penalty is that to receive these signals, designed more for the scientific and forecasting orientated market, you need a much larger dish than for the WEFAX transmissions and a whole new receiving system. But I know of no-one who having once received Primary data can bear the thought of returning to Secondary data, the difference is so great! Which brings us back to the ongoing saga of Primary Data reception. So meanwhile back at the ranch as we say...

A year later a software upgrade took the basic programme suite to new heights, and the number of PDUS users steadily grew. Unfortunately, no one could have guessed at the time that encryption of the signals was about to become a reality. What started as rumours soon began to have a more solid feel, and with the possibility that amateurs could be shut out altogether from European HRI transmissions, PDUS went into a state of limbo.

In fairness to Timestep, they continued to back their system and about a year ago a superb new animation update escaped the confines of Wickhambrook! I say escaped, because I have yet to define the baud rate of a certain serial comms method known as V.Grape-vine! Now the pictures have temperature calibration, a whole host of colour palettes and various user controllable settings which refine the whole system of infra-red display to an amazing new level of sophistication. Don't you just love being in control?!

Towards the back end of last year several significant events took place. A phone call to the Met office confirmed that full access to PDUS transmissions for amateur/educational non-commercial organisations would be free of any licence charges. That was the good news. Furthermore, every six hours there would be a dissemination of un-encrypted images. However, it became clear as well that for unlimited reception an MKU (Meteosat Key Unit) device would be required from Eumetsat, and the charge for this would be in the region of 700 ECUs, converting at the present exchange rate to about £580. (At least VAT free I believe). A one-off payment, but a hefty commitment, and then there was the interface required to connect the key to the system. Could or would Timestep rise to that challenge?

Two further developments then took place which sent many PDUS users into the slough of despondency. Meteosat 5 began to experience the same antennae problems that had previously struck Meteosat 3 and rhythmic dips in the signal strength meter confirmed the malaise. Then, mysteriously, 'salt and pepper' noise began to be seen on many pictures and, in its severest form, caused the loss or displacement of whole lines of data. It appeared that a new MDD channel had been added, and in balancing the power to the various channels, the satellite operators had taken a small amount away from the Primary Data power output. Small but highly significant for amateurs. The combination was deadly! Interestingly, a local fellow user, Colin Gundersen (he of the excellent dish mount fame!) has indicated that using a five foot dish, his pictures clear up considerably for about six hours during the night. This probably suggested that if the system is operating on a margin, then very small differences, such as diurnal changes, will produce significant display changes whereas those with dishes larger than 2.5 metres have yet to see a problem!

So was this to be how Primary Data ended, not with a bang, but with a whimper? Was there any point now in considering obtaining a de-cryption unit for poorer quality pictures?

I know it sounds corny but just when the besieged group of PDUS operators were about to hoist the white flag, the Timestep cavalry came riding over the hill! My ancient receiver, card and LNA went back to basics at Timestep, and a couple of months later a new, enhanced system returned which was entirely free of noise. For the curious, the engineer's report read as follows:

1. Pre-amp noise figure changed from 0.7dB to 0.4dB - 0.3dB reclaimed.

2. Receiver demodulation threshold reduced by 1.5dB. Achieved by changing the demodulator PLL response and generally tightening up on IF bandwidth parameters.

3. PC card clock recovery loop filter improved under low threshold signals, an estimated 1.4dB overall improvement.

4. The Bit Sync State Machine (a custom chip) has been redesigned to give repeatable results at low levels. About 1.0dB improvement.

A quick addition shows a 4.2db improvement, which in theory is more than enough not only to lift the signal out of the noise but allow a bit of headroom for any further balancing of the satellite power output. With my 2-metre dish, all noise has vanished.

The good news is that all their new systems are being shipped with the above improvements and all previous owners qualify for the upgrade, with a sliding-scale charge based on the version you may have. Give Timestep a call for details and a quote.

Those still interested will say: Aha! (Or words to that effect) but what about encryption?. It has been coming slowly but by September it will descend upon us all in it's awesome completeness. Do I hear more cavalry?

If you wanted to have an interface from VCS, the German firm responsible for a lot of the encryption equipment, you could be looking at a bill for £6,000 at which point most of us would sigh and settle for six-hourly data which is not dissimilar to the frequency of NOAA passes. But the Timestep people have a cunning plan and for a slightly more modest £150 you can now purchase an encryption interface complete with all the necessary cables and plugs to connect to your MKU. It comes as a separate card requiring an 8-bit slot in your PC and needs access to one IRQ which can be set for 3, 4 or 5. There is some new software to go with the card but basically, the whole thing remains transparent to the user. All that happens is that you get access to the whole range of data as usual, instead of seeing a lot of black and white dots on the screen!

I cannot comment on the efficiency of the card, not having an MKU, but if you're willing to see it as a long term investment, then a total price of some £750 for a long-term and unlimited reception of PDUS might just seem worth the investment. I am grateful to Gordon Bridge of Eumetsat who confirms that regretfully, the payment stands for amateurs and the MKU cannot be sold to another party. To clarify things further, the one-off payment of 700 ECUs is not only for the MKU but for access to the intellectual rights of the data and hence is non-refundable. The good news is that the MKU will be valid for all the METEOSAT first generation satellites, up to METEOSAT 7, to be launched in about 1997. This last one in the series is expected to have a life of at least 5 years, so that we can confidently expect a good seven to eight years or more for the initial cash outlay. Beyond that lies the next generation (No not Star Trek!) of satellites, with an increased data rate transmission, and who knows what systems will be required then, but as they say, seven years in the space industry is a long time! Maybe encryption will have been revoked, maybe the polar ice-caps will have melted, maybe we'll..... 🌐

CD-ROMs FROM NASA

Mike Cook

Introduction

Remote imaging is not just about looking at weather patterns; it is the acquisition of images from any point distant to the observer. You don't get any more distant than some of the places that NASA has sent robot probes to over the last twenty years. The images from space-probes adorn practically any book on astronomy nowadays but have you noticed that you see the same shots over and over again? There are only ever a handful of images of any one subject despite the fact that the probe probably sent down thousands.

Imagine if you could get hold of those other images, what secrets might there be waiting to be unlocked? Well, thanks to the American Freedom of Information Act you can and at a knock-down price too. The American law forbids NASA from making a profit from the sale of its information because, so the reasoning goes, tax payers have already paid once to fund the project. Therefore NASA has a policy of providing very low cost access to its vast store-house of information.

This is done through the medium of compact-disk ROMs or CD-ROMs and they are readily available to the public. I have been collecting them for about three years now and have nearly 200 of them. The pricing policy is quite simple; there is a handling charge of $30.00 per order and an overseas postal charge of $5.00 and after that each CD is priced at $6.00. At that price you can see why I can't get enough of them. Ordering is easy too as they accept credit card payments. I have even ordered by E-mail. If you write they will send you a catalogue or if you are connected to the Internet you can get the catalogue and sample images directly.

The Images

The CDs tend to come in sets covering different missions but most sets can be split so there is there is no requirement to order all the disks from one set. Indeed, as the sets are constantly being expanded there always seems to be new disks available every few months. Some sets are small; the Einstein X-ray telescope high resolution data-set has just two disks while others are truly huge like the Venus Magellan set which currently goes to 120 disks and is still rising.

What you get in many cases is the raw data, sometimes unprocessed and often classified only by acquisition date. So what can you do with the images? Well, in order to use them you will need some form of display software. There are several public-domain packages and NASA can supply these at minimum cost when you place your order. I am lucky enough not to have to bother with PCs and so I do all of my work

with Macintosh and Acorn computers. The software recommended for the PC is called IMDISP but I can tell you little about its capabilities. The main package I use is IMAGE 1.52 for the Macintosh which is quite powerful in that you can write macro extensions to the package to repeat a number of operations with one menu selection. With this capability I have written a number of macros to handle the different file formats used. The main file formats used are FITS, PDS and Vicar2. These are basically uncompressed raster files with text-like headers that can be read with any word processor. Also the disks have documents describing the image file formats so I have found that I can always view the images.

Image Processing

Having viewed them what else can you do? Well, there is the whole range of image processing techniques that can be applied from contrast stretching to complex filtering. Note here that most of the time you get the raw data which means that sometimes there are chunks missing due to transmission errors, or there is a huge blank area in the image and only a quarter of the target in the bottom corner. It is fun piecing these neglected fragments together to make a view not seen before.

All the images are in monochrome, that is they are intensity images. However, many frames are multiple images taken through different coloured filters. With these it is interesting to combine them to produce a colour image from three monochrome ones. Many of the filters used are outside the visible part of the spectrum and using these can produce the very strong colour so much loved by many printers. However, you can get quite close to "real" colours and the results are so much more subtle and delicate than you will normally see elsewhere. It helps here if your computer has 16 or 24-bit colour capabilities as you can't coax much subtlety out of an 8-bit colour system although you can still get interesting results. Even with a single image you can apply a false palette of colours to bring out detail that would otherwise be lost.

My favourite application is making movies from the data and this is especially easy in IMAGE 1.52 which has an option to stack all opened windows and animate them in a loop with just two menu selections. The ozone data CDs are very good for this as you can see the concentrations of ozone swirling round each pole with rippling, shearing patterns at the equator where the two contra-rotating circulations converge. Also, you can see the ozone hole over the south pole in spring rotating around like a wobbly jelly.

There are some disks of Mars and Venus which contain not image information but height maps. In these images each pixel's value is a measure of the height of that point above some datum. If you have a program called VistaPro you can use it to create views of the planet from any angle. You can even put trees, lakes and clouds in the picture to "terraform" it!

What I plan to do over the next few issues is to give you a brief idea as to what to expect in specific sets of CDs. This time I will tell you about the Galileo set of CDs.

The Galileo Data Set

The Galileo spacecraft is on its way to Jupiter to spend some time in orbit around the planet. It's not due to arrive until December 1995, so you might be surprised to learn

An unusual view of the South Pacific and Antarctica as seen from Galileo.

that there are already 14 CDs available. Rather than go the direct route out to Jupiter, Galileo is taking the scenic route via Venus for a gravity-assist boost to its velocity. This means that it gets to look at cloud-covered Venus as well as making two passes of the Earth-Moon system for further velocity boosts. As an added bonus it got the first ever close-up looks at the asteroids Gaspra and Ida.

Unfortunately, there is a problem with Galileo; its main antenna did not deploy properly so it can't communicate very well with Earth. Galileo has considerable image storage capacity and selected data can be trickled back to Earth slowly through a telemetry antenna. This means that many of the images suffer from corrupted data which look like tear lines. They are particularly noticeable on many images of the second Earth encounter. Multiple versions of some files, derived from separate down links or playbacks, have been merged to produce a file containing the best data.

Each disk contains about 800 images of size 800 by 800 pixels. This is after cropping 200 bytes of telemetry data from the start of each line. Each image is stored as a VICAR file with an accompanying, detached, PDS label for each image. Also included are documentation files which contain a description of the organisation and contents of each disk and the definition of the labels. Most of the disks contain a mixture of lunar and Earth images as well as calibration shots. Images of Venus are present only on volume 2 and Gaspra images are only on volume 7.

Subset Information

Volume	Object
2	Venus, Earth
3-6	Earth, Moon
7	Gaspra
8	Calibration only
9	Moon 2nd encounter
10	Earth, Moon 2nd encounter
11-15	Earth 2nd encounter

Images of the asteroid Ida's fly-by have yet to be released on CD. Volume 1 contains information about the spacecraft's position and is not yet available. If I were going for a subset then I would chose volumes 3-6 as there are some very good shots of the Earth and Moon. Sometimes however, the images are over exposed or cover only a tiny portion of the frame. For example, due to its distance and small size, the first image of Gaspra covers only about 15 by 15 pixels in an 800 by 800 image, although there is the odd star visible. In fact some images look totally blank. There are some very good shots of the Moon showing parts not visible from Earth. The Earth shots vary from full-globe images to close-ups of clouds but as the encounter only lasted a few days

there is little in the way of weather development to see although there are good images of Antarctica. Calibration files allow precise measurements to be made but they don't make any difference to the appearance of an image.

For further information contact:

World Data Center-A For Rockets and Satellites, Goddard Space Flight Center Code 633, Greenbelt, MD 20771, USA.
Internet Requests@NSSDCA.GSFC.NASA.GOV
Galileo Project Home Page "http://www.noao.edu/galileo/

Cost: $84.00 + $13.00 (per software package) + $30.00 request handling + $5.00 (overseas only) shipping/handling.

Software: IMDISP (DOS) or Image4PDS (Macintosh)

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SENDING SINGLE FLOPPY DISKS BY POST

Les Hamilton

Many RIG members, myself included, tend to send single 3.5 inch floppy disks through the post in an ordinary envelope these days. While this seems to work 99% of the time, I have recently become aware of a problem. From time to time, a disk is received with a noticeable "pinch" mark or crease across the metal gate. In the worst cases, this results in the sliding gate jamming so that the disk cannot be read until it is physically removed, rendering the disk thereafter unusable. Other effects are that the disk will not fit into the drive, again necessitating removal of the gate (since it is impossible to straighten it), or, more disconcerting, that the disk will not eject from the drive. This last problem can, however, easily be rectified by carefully using tweezers to effect the disk's removal.

I suspect that, during the Post Office's automatic letter sorting process, a jaw grips the envelope. If the gate of the floppy disk happens to get in the way, it is pinched, and deformed to a greater or lesser degree. I would recommend that it is prudent to reinforce the disk by folding a small sheet of light cardboard into a V-shape, and resting the floppy disk gate downwards in this before insertion into an envelope. This should prove adequate protection for a single disk, without resorting to a Jiffy bag. ⊕

WORLD WEATHER HIGHLIGHTS
February-April 1995

Record high April surface pressures were reported over parts of southern Britain on 14 April and at the same time, with weather systems pushed well to the south, parts of southern Spain and Morocco had their first significant rainfall for years but there was not enough to alleviate the severe drought in Andalucia.

With the monsoon rains still weeks away, temperatures soared to near-record early summer highs in large parts of India. Severe duststorms sand-blasted Delhi and temperatures approached 45C (113F) in Calcutta. In many areas wells are dry and whole villages have been evacuated. There is unprecedented drought in Tripura state in the northeast.

Exceptional storms pounded China's southern Guandong province in mid-April killing many people and leaving a trail of destruction. Nearly 14,000 hectares of farmland were flooded. Hailstones were reportedly as large as basketballs, weighed up to 15kg and caused some deaths. Tornadoes added to the havoc in which more than 2000 homes collapsed.

Tropical Cyclone Bobby formed in the western Timor Sea on 21 February and reached hurricane strength two days later. It made landfall in NW Australia near Onslow where a peak gust of 99kt was recorded. A large part of the coast was affected and several fishermen were drowned. Elsewhere in Australia, the growth of vegetation following recent rain has led to a massive increase in the locust population which has taken a liking to the sorghum and sunflower crops in Queensland.

Exceptionally low April temperatures were reported from parts of the USA in April with -15C in the extreme northeast. A 60cm late spring snowfall in the Dakotas caused chaos in places. ⊕

PRODUCT NEWS

Timestep have improved the overall performance of their PDUS considerably by making several changes. Their preamp noise figure has been reduced to 0.4dB and the receiver demodulation threshold has been reduced by 1.5dB. The PC card clock recovery loop filter has been improved to give better performance under low threshold signals and finally, the the Bit Sync State Machine (custom chip) has been redesigned.

The overall improvement is greater than 4dB and Timestep claim perfect results on a 1.6m dish. New systems are being shipped with the improvements but contact Timestep for a quote on upgrading old systems. ⊕

MEMBERS' LETTERS

Dear Peter,

I can readily recall the excitement caused by John Tuke's first picture from an APT weather satellite about thirty years ago (See Fifty Years of Weather in RIG 39). As mentioned in his article he was already receiving and printing weather charts from all over the world on a home-built fax machine. However, after reading in Wireless World that the Met Office was building a station to receive from the American APT satellite about to be launched, he did some research and set about building the necessary VHF electronics and a ground-plane antenna to assess the possibilities.

Satellites were big news in the sixties and I took on the simple task of monitoring the USA news broadcasts. After a few weeks I was able to tell John that the satellite was in orbit. Not wanting to miss seeing the first picture I went to John's station for the great event. Nothing was heard during the first three days and I was unable to be there on the fourth. On that day John arrived at my house waving a piece of Teledeltos paper showing cloud formations in one hand and, by way of celebration, a box of Cadbury's Milk Tray chocolates for my wife in the other. What a day!

73, Drew McGuffie, GM3CEA, Willowcroft, Churchill Avenue, Stranraer, Wigtownshire, DG9 0JD.

Dear Peter,

First of all, congratulations to you and our RIG committee on another wonderful journal. Successive issues get more informative and interesting. Keep it up!

Now I must tell you of my success in almost totally eliminating commercial RF interference on WXsat frequencies. I now regularly receive stupendous images from NOAA 14 and a long-standing sync problem with Meteor reception has almost been eliminated. What have I done? Here is the story briefly.

My antenna is a folded dipole turnstile with reflectors and is situated about 12m above ground level on a metal mast. Originally the RG 213 coax feeder was earthed to the main station's earth in the radio room which also grounded all the amateur RX and TX equipment. I have now established a separate earth point adjacent to the turnstile mast and this comprises a 3m bronze condenser tube driven into the ground which is kept constantly moist at this point. A tinned copper braid soldered to the earth tube extends up the mast bridging all bolted joints and is connected to the coax

cable at the balun and extends further on up to the reflectors where it is terminated.

The station's earth has been disconnected from weather satellite equipment and it is almost unbelievable that this simple change has virtually solved my problems.

Yours sincerely, George Jillings, Dalham, Dalham Road, Strawberry Lane, Constantia 7800, South Africa.

Dear Editor,

Last year I wrote a series of articles on weather satellites and remote imaging for the Amateur Radio Action magazine which has nation-wide coverage here in Australia. I was surprised at the interest they generated and I have now been asked to write a regular column. Many letters expressed interest in forming a satellite group but I have yet to make any progress in this area though I have sung the praises of RIG which, in my opinion, is second to none in the world. I am compiling a list of suppliers of weather satellite equipment available worldwide for my readers, so if there are any suppliers who would like to send me their catalogues, prices, demo disks etc. I will be pleased to include them on my list at no charge.

I have been concentrating on promoting the educational value of weather satellites in schools. I produced a booklet for teachers and interest is increasing. One concept that I want to promote is interaction between our schools and those using weather satellites in other countries so that teachers and students can exchange information and images. I would be very interested to hear from any teachers in the UK and elsewhere who use weather satellites in their curriculum. The main interest would be what type of station they are running and how they use the received data as an educational tool. My thanks to RIG secretary, John Tellick who has given me some ideas on this subject.

Cheers to all, Arthur Andrews, 30 Araluen Road, Wollar, NSW 2850, Australia.

Dear Peter,

Your mention of RIG possibly getting on Internet was of much interest to me as we have an active WWW site here at Edge Hill College. I use it to the full to view the images available and it is truly amazing to to see the diversity of what is available, including de-classified spy-sat imagery.

What is the consequence of easily available information? Will it stop people from trying to obtain images directly from satellites themselves when they can obtain first class results over the WWW?

The sources of imagery can be as diverse as they are specialist. I have an interest in

UV detection and have found that the University of Auckland, NZ, through their interest in the Antarctic dissemminate information on UV topics on Internet.

Having had a long-term interest in obtaining my own satellite imagery even I must admit that being able, at no cost to me, to browse all the world's bulletin boards for current imagery as well as other related weather topics does pale one's own activities into some insignificance. Because it is so easy, will it curtail the pioneering instinct of the amateur to do it for himself? I hope not. Indeed, it seems the topic is a dichotomy within itself and I must admit that if it wasn't for the ease of using the search facility within WWW I would not have found out about the U of A in New Zealand.

I would be interested to hear other people's views on the subject. I have always paddled upstream against the tide in pursuit of knowledge muttering the phrase "No pain, no gain". If it was as easy for me to obtain imagery all those years ago would I have persevered?

Peter Stein, <STEINP@ccs.edge-hill-college.ac.uk> 🌐

ANYTHING BUT BOARD
A progress report on the RIG Receiver PCB
Bryan Taylor G8TPC

Earlier this year whilst waiting for someone else to produce a PCB for Ray Godden's excellent 137Mhz receiver it became clear to me that those already involved already had very heavy RIG commitments, to say nothing of other minor matters such as work etc. Knowing how an undertaking of this sort can grow, given half a chance, I was somewhat reluctant to offer to undertake production but, at the same time, I was in need of a good receiver. So, as is so often the case, self interest overcame discretion and I offered to get a board produced and, for my sins, the offer was accepted.

Michael Gill had already produced the artwork using, I understand, a desk top publishing package which is no mean feat! This enabled me to produce this first prototype to prove the design and to spot any mistakes. Fortunately the design stood up well to being transferred on to a PCB and the were only a few minor errors on the layout. We had a viable board. All our problems were over, well not quite!. The next hurdle was to pursue a manufacture to produce 100 boards at a sensible price. After much arm twisting this was achieved and an order placed. Whilst they were being produced many happy hours were spent producing, proof reading and re-editing the documentation. Then there were the joys of getting together the bits and pieces. Have you ever tried putting 12 different value capacitors into 100 small plastic bags which have been cunningly designed not to be opened in under 1 minute? It's good fun I can tell you!

Then the great day arrived; the boards were delivered on the day they were promised. The next three days were something of a blur of Jiffy bags, filters, instructions, letters, labels, stamps and a bemused sub-postmaster. By the end some 64 packets had been despatched and the dining room returned to normal use. Since then the remaining 36 boards have all been sent to good homes and the second batch of 100 is now to hand.

Such was the impact of our efforts that, despite forewarning Cirkit some weeks before hand, we have managed to use every remaining Toko 4T5 coil in the UK. We have trawled the UK and a fair bit of the continent trying to find additional coils but without success. So now we have to wait until early July for the next batch from Japan. Our source of IF filters is drying up too. We have sufficient to go with the current 100 boards but then that will be the end of this particular design. If by any chance you are aware of a quantity source of this particular filter (ITT 904DM) I would appreciate a call.

Now for a more positive note. Such has been the demand for the set that we will be producing a 5-channel daughter-board for the receiver, possibly by the end of the year. One of the problems of producing PCBs is gauging the likely level of demand, so if you think you may be interested please let me know and I will put you on the list.

Finally, I must thank Ray Godden not only for all his efforts in producing the first class design but also for his support and infinite patience throughout the exciting development period. Many thanks also to Michael Gill for the original artwork and all the revisions. My greatest thanks must be to you, the RIG members who have purchased the boards, for all your kind words and for the great forbearance you have shown when things have not gone quite as smoothly as I might have wished. ⊕

CD-ROMs

The ERS-1 CD-ROM stocks are now exhausted and no further supplies are available.

Likewise, the first Meteosat CD-ROM is no longer available but a relacement has been obtained. Meteosat 2 is available for the same price and the blurb on the package reads thus: "Weather is a fascinating topic: everybody talks about it! Thanks to this CD-ROM you will be able to talk better about stable and stormy weather over Europe and America, about Hurricanes and tropical storms over the Caribbean Sea and the Indian Ocean. Packed with more than 3000 original satellite images, this CD-ROM is a perfect tool for the illustration of classroom lectures. The images can be manipulated and converted. The temperature of the surface of the sea or the top of the clouds can be computed. The meteorological phenomena can be directly observed in full motion thanks to the loops in AVI format which are included"

See RIG Shop Corner for prices and ordering information. ⊕

SHAREWARE CORNER

Les Hamilton

Firstly, apologies to a few of you who ordered Disk V-01 during the first few weeks of March. Although no-one has complained, I had failed to upgrade QPEG as indicated in the Journal. There was also a problem with early despatches of Graphics Workshop for DOS on Disk I-05, but this also has been rectified. So if you ordered these disks, and were disappointed, feel free to send for upgraded replacements gratis.

This issue sees a new disk category introduced, which caters for weather prediction programs. Members send me shareware of this type from time to time, so clearly there is an interest in this field. The remainder of this quarter's offerings relates to satellite tracking and prediction, and to image processing, with a selection of new programs and significant upgrades of well tried favourites.

BIRD DOG V 3.0

Inexplicably, the satellite tracking utility Bird Dog took an aversion to Keplerian elements from midnight 31 December last. Presumably through some quirk in its internal maths, it refused to output correctly when supplied with Keplers with epoch year 1995. Now version 3.0 has become available, and though the documentation states that this is only a beta version, the indications are that the problem has been ironed out. If you have ordered Disk T-03 since early March, you will already have the upgrade. If you haven't, Bird Dog is a great DOS program, showing the positions of up to 16 satellites on a World Map in real time. Ground tracks and acquisition windows can also be drawn, and tables of ephemerides printed to either screen or printer. [Disk T-03]

WSAT V 4.5 J

Gordon Train's Weather Satellite Tracker program, which can, if desired, be interfaced to run directly from within the PROsat II program suite, has been well received by RIG members since it was first offered last September (RIG 38). Map redrawing has been speeded up considerably, as have the fast forward/reverse functions. Several other small improvements have been made and the latest version is particularly user-friendly in reading Keplerian elements directly from 2-line files thus greatly reducing the chore of regularly updating the program. [Disk T-03].

CHOP and REJOIN

No doubt every PROsat II user has from time to time acquired a complete satellite

pass, and wished that it could be archived in its entirety without taking up valuable hard-disk storage. These two offerings, also from Gordon Train, allow just that. CHOP.EXE will divide a large .NOA file into two portions with extensions .1st and .2nd. These can be stored on separate floppy disks. When the need arises, simply copy both these files into the VGASAT4 directory, and run REJOIN.EXE to restore the original .NOA file. Both fragments of the original file contain the header line, and can be viewed individually in PROsat II if desired. [Disk F-01]

VPIC V 6.2

Yes! VPIC has been reviewed before (twice) . However, I make no apologies for extolling its virtues once again, since it has now been considerably enhanced. VPIC is under continuous development, and the latest version boasts a number of features that will be of interest to both experienced users and new members. Probably the best dedicated image viewer for DOS, VPIC now adds the ability to view 24-bit (tru-color) BMP, TIF and PCX files, yet includes an excellent colour-reduction dither option to convert to 8-bit, so that images can be viewed on any graphics card. Amateur radio slow-scan TV HRZ files are supported for the first time (display only). Another long-awaited enhancement is an option (Alt-G) for "intelligent resizing", so that an image as large as 3000 pixels square can be viewed in its entirety. VPIC has also undergone major programming revisions, and now decodes and displays 24-bit images much faster. There is also a new option which displays slide shows of images without blanking the screen between them. This has been added specifically for producing "weather map" type animations, and could appeal to Meteosat users as an alternative way of producing a dynamic display. A long-established feature of VPIC of which many users appear unaware is its ability to convert images between different graphics formats. With an image on screen, a number of keyboard keys automatically save image files: G - GIF, Z - PCX, T - TGA, W - BMP, S - TIFF plus a few others. JPEG files are not yet handled, but this feature is expected before long. All in all, an excellent piece of software, which can now be registered by credit card transaction. My copy cost £22, including a printed manual (optional), and took just under three weeks to arrive. [Disk V-01]

SVGA V 1.12

This is an easy to use multi-format image viewer designed for browsing quickly through a collection of image files. It is limited to GIF, BMP, PCX and TGA files but is capable of handling TrueColor PCX, BMP and TARGA images. Automatic support is offered for VESA, and a wide range of SVGA cards. SVGA gives possibly the best screen resolution of any image viewer, and can cope with images up to 8000 pixels square. SVGA consists of a single .EXE file and is very easy to operate. No configuration files are necessary. The program's most appealing feature is its zoom-and-pan features. Function keys f9/f10 zoom in/out, while the cursor keys pan instantly around any

image that exceeds the size of the screen. [Disk V-01]

WXSAT PREDICT

A few years ago I offered RIG members two programs, PREDICT and AOS_TIME which assisted in calculating aquisition of signal times for wxsats. WPREDICT is a Windows program that combines the functions of both its predecessors, plus a few additions. WPREDICT opens with a display screen that expands 2-line elements into a readable form for a default file of satellites, and there is an option to update this information directly from your own 2-line element files. WPREDICT can display the most favourable passes (maximum of four in each direction) for a selected satellite for one day, and also create a listing of AOS times for an entire month. These data may be sent to either screen or printer. Additionally, there is an option to display the relevant ground-tracks on a map of the world, where an indication of a satellite's footprint is added when its approach is near. This program has been tested by several RIG members over the past few months, and appears to work well. I cannot, however guarantee that it is totally bug-free, and will be interested to learn of any problems that may arise during its use. [Disk T-03]

DISK W-01 (new disk)

This is a new disk devoted to DOS programs related to weather prediction from observations, rather than to Remote Imaging. The programs offered at present are WEATHER V 3.60, WX-60, WEATHER WIZARD and WIND-CHILL. The first two require keyboard input of prevailing and recent weather conditions, and attempt to predict the subsequent 24 hours conditions. WEATHER 3.60 is by far the more comprehensive, and includes useful information screens on a number of weather phenomena such as tornadoes, drought, climate, temperature, etc. It can also store cumulated data for a month, then display it in graph form. WEATHER WIZARD is similar except that all input is from menus using the mouse. WIND-CHILL is a simple but effective program which accepts input of temperature (Celsius) and wind speed, and computes the effective wind-chill figure.

SHAREWARE TITLE CATALOGUE

Disk A-04: *Earth Centred Universe, Lunar Eclipse, Skyglobe, Skyview, Solar Eclipse Predictor, Solar System Finder.

Disk A-05: *Skymap - Planetarium that displays and prints star charts etc.

Disk C-02: Hamcomm, JVFAX-70, Packet Monitor, RTTY_FAX, Satcom.

Disk F-01: CUTNOAA, DATtoPA2, JOIN-PIX, NOATIFF, CHOP, REJOIN.

Disk I-04: *Image Commander, GIF Palette, GIFtoJPG, *Iphoto, JPEG5386, JPGtoGIF, *Paintshop Pro, *Vue Print.

Disk I-05: Graphics Workshop for DOS, IMDISP, Neopaint V 3.0.

Disk I-06: *Graphics Workshop for Windows, *Lview Pro, *Photolab.

Disk T-03: AOS, AOSUS, NOAATime, Predict, * SatTrack, Weather Satellite Tracker.

Disk T-04: Bird Dog 3, *PC Track, *STS Orbit Plus.

Disk U-02: Adjust Clock, BBC Time, Clockwork, PC Configuration, Fast Geo-chronometer, *Geoclock, Make PCB, PKunzip, Screen Thief, SSTV FAX.

Disk U-03: *RIG Journal Index, RIG Shareware Catalogue, HURRTRAK V 5.0 (1994 version), *WINSTORM, Weather Forecast.

Disk V-01: Compushow, GIFdesk, GIFEXE, GIFREED, QPEG, VPIC, *WINECJ.
Belmont: *Belmont Image Technician (sophisticated image processing suite)

Programs requiring Microsoft Windows are indicated by an asterix (*)

HOW TO OBTAIN COPIES OF THE RIG SHAREWARE LIBRARY DISKS

Send up to a maximum of 6 formatted 1.44 Mb MS-DOS 3.5" disks per request, to Les Hamilton, 8 Deeside Place, Aberdeen AB1 7PW, Scotland. Disks must be sent in a sturdy, re-sealable package such as a padded Jiffy bag (or a package within a package), and each separate request must be accompanied by:-

i) a self-addressed adhesive label
ii) stamps for the return postage
iii) coins (or additional postage stamps) to the value of £2.

Note that overseas members' return postage is free, but an exchange of shareware or satellite images in lieu is always welcome.

Any RIG Member coming across any new or updated versions of useful shareware is welcome to send them to me at the above address. Should you experience any problems running any of the shareware from the RIG Library, please enquire by letter, and I'll reply by return of post. ⊕

ORBITING UPDATE

ALL THE LATEST NEWS

POLAR-ORBITING SATELLITES

NOAA 9 continues to image reasonably well but the APT transmitter is switched off for a few days at times of conflict with NOAA 14 which also operates on 137.62MHz. The Microwave Sounding Unit and the Space Environment Monitor are inoperative. There was an unscheduled shut-down on 13 February when onboard computers detected an anomaly and "safe-stated" the spacecraft. The anomaly may have been caused by geomagnetic and solar events and normal service was soon restored.

NOAA 10 is approaching the end of its life but some systems are still operating. APT is off. HRPT is operating although infrared imagery is seriously degraded.

NOAA 11's imager failed last year but some other systems are functional. Only the Search and Rescue Processor is operational at present.

Modified flight software was uploaded to NOAA 12 in early February to reduce the impact of any gyro failure following the detection of instability in one of the redundant gyro units. Otherwise, this spacecraft is operating normally.

NOAA 14's early life has not been uneventful. Anomalies with one of the Digital Tape Recorders remain under investigation and on 24 February one of the infrared detectors in the Earth Sensor Assembly developed a fault causing attitude instability problems. A contaminated lens is believed to be the cause and software changes have been implemented to prevent any further lens degradation from impairing NOAA 14's attitude performance. During the initial attempt to overcome this problem an incorrectly calculated checksum digit led to two orbits in safe-state on 27 February with all systems off. Early detection of a problem with the Microwave Sounding Unit on 2 March prevented possible further damage. The scanner mechanism failed yet the motor continued to draw power causing overheating. The scanner is operating nominally now but a software modification has been incorporated to ensure the motor switches off should the fault recur. Abnormal operations were detected for a time on 10 March from the AVHRR scan motor. This unit is not the same as the one which failed on NOAA 11 last September. The Toulouse Space Centre is troubleshooting NOAA 14's Search and Rescue processor problems and meanwhile, the one aboard NOAA 11 is being kept operational.

METEOR 2-21 came on for a time in late March and early April and again in late

April. Currently, 5 May, it is causing some interference to Meteor 3-5 for those people without directional antennas. They are both operating on 137.85MHz but Meteor 2-21's signal is mostly weak and the images poor.

Apart from a break of three weeks from mid-March, METEOR 3-5 has transmitted good imagery since early January and is well positioned to image northern temperate latitudes for some months yet. By the time the southbound morning passes precess into the dawn the evening northbound passes will be adequately illuminated. With its height advantage over the NOAA spacecraft it is a thousand kilometres further away when near the horizon permitting views almost to the north pole from southern England.

The return of METEOR 3-6 seemed likely when a FANAS prediction bulletin was issued from Moscow but although the encoded data purported to be for Meteor 3-6 is was in fact consistent with the orbital parameters of Meteor 3-5! Nothing has been heard from Meteor 3-6 for over a year now.

OKEAN 4 has been busy monitoring the ice break-up in the Arctic and has transmitted on most days in recent weeks. The fears expressed in the last issue about the state of its radar proved unfounded and the satellite is producing superb imagery in all modes. European high-latitude observers are in the best position to receive images and Bertil Aquilon at 60 degrees north in Sweden has got many good ones.

Although amateurs cannot receive imagery directly from the European ERS-2 satellite recently launched, I am sure images from it will appear in the Journal in due course. It was launched on an Ariane 4 vehicle from Kourou at 0144UT on 21 April into a near-polar sun-synchronous orbit similar to that of ERS-1. The two spacecraft will operate in tandem and the joint operation of two radar satellites in well-tuned orbits will enable the full potential of synthetic aperture radar interferometry to be exploited. This will result in the Earth's surface being mapped to unprecedented accuracy with obvious benefits to vulcanologists and seismologists.

GEOSTATIONARY SATELLITES

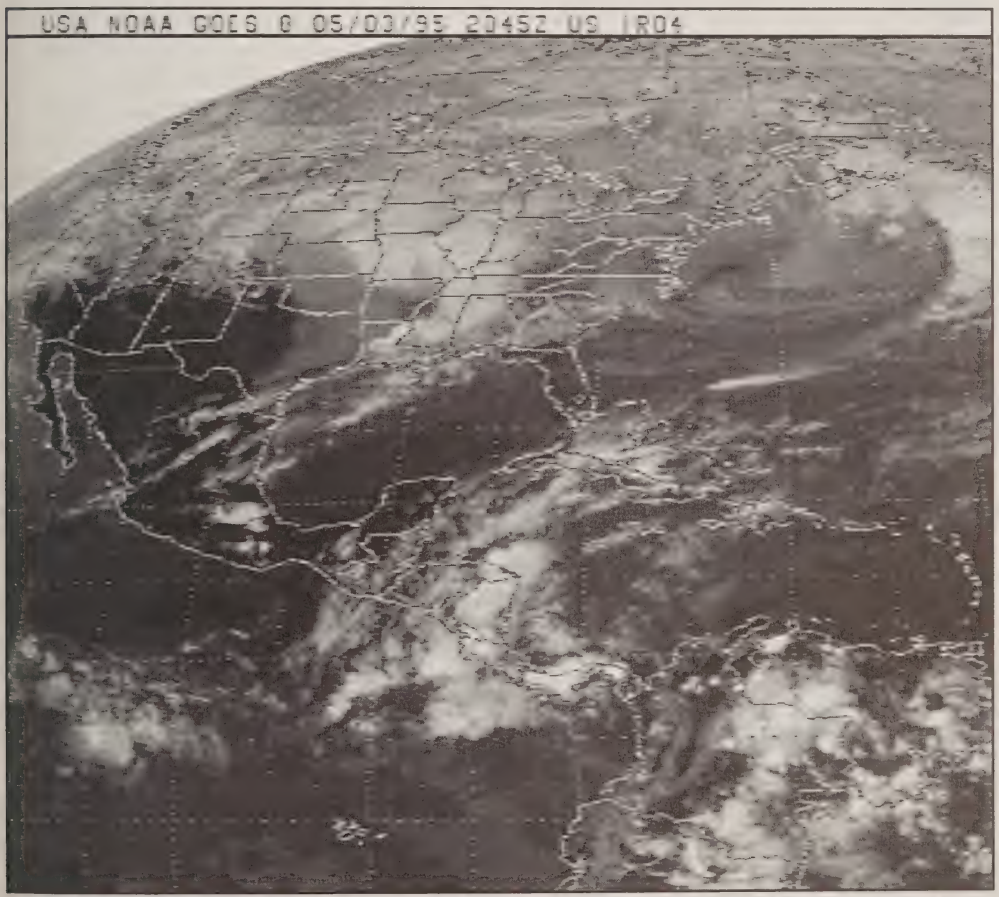
METEOSAT 3 at 69W is due to cease imaging on 31 May. It will remain on standby for a time before being boosted out of the geostationary orbit, probably by the end of November.

METEOSAT 4 will move to 10 degrees east in mid-May in preparation for its use to validate the new EUMETSAT ground segment between mid-June and September 1995. In this period, the satellite will be commanded by EUMETSAT and will image from time to time.

METEOSAT 5 remains the nominal spacecraft at zero degrees longitude.

METEOSAT 6 will remain as the standby for METEOSAT 5 and is at 10W. The anomaly investigations are continuing and currently (early May), METEOSAT 6 is in continuous imaging mode in order to validate the new anomaly correction software. This software is being tested within the ESOC environment but will, in due course, be ported to the EUMETSAT environment, expected during the summer.

Some limited (low user impact) encryption of image data will commence in June, mainly a few LXI formats provided by Lannion and some BW formats provided by ESOC. From 1 September 1995 a significant number of BIV and AIVH formats, and the AV format are expected to be encrypted, except for the 6-hourly data (00, 06, 12, 18UTC). Every HRI format except the 6-hourly will be encrypted from 1 December 1995.



Part of an image received by James Brown from GOES 8 at only 3° Elevation using a loop Yagi antenna.

GOES 8 was moved from its check-out position at 90W and reached its operational position of 75W on 27 February. Almost a year elapsed between launch and the fully operational status which gives an idea of the complexity of this, the first of a new generation of geostationary weather satellites. The next GOES is due for launch on 19 May and will be checked out at 90W for a few months before replacing GOES 7 at 135W.

GMS 5 was successfully launched by an H-II vehicle from the Tanegashima launch site in Japan at 0801UT on 18 March and after being checked out at 160E will replace GMS 4 at 140E longitude in mid-June.

GOMS/Electro 1 appears to have serious problems. This spacecraft at 76E is irritatingly close to the horizon for UK members but Arne van Belle in Rotterdam, Holland and Chris van Lint in Hong Kong have been monitoring signals. Arne got a poor image on 20 March on 1691 MHz with the spacecraft within three degrees of his horizon yet the image was clearly dated 28 February! This same image was further repeated several times. Chris also reported signals on 1673MHz which may have been raw image data. The annual meeting of the Co-ordination Group for Meteorological Satellites takes place in mid May and the Russian representatives are likely to

reveal more information then.

Acknowledgements: I am grateful to the following for their assistance in compiling this report; Gordon Bridge, EUMETSAT; Dr Donald Hinsman, WMO Geneva; Richard Emerson who runs the WXSAT mailing list; numerous NOAA/NESDIS staff and RIG members John Tellick, Arne van Belle, Dave Cawley and Chris van Lint. -Ed.

KEPLER ELEMENTS

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NOAA9
1 15427U 84123A   95124.78451330  .00000064                      2394
2 15427   99.0017 183.2412 0015872 34.1749   326.0436 14.13702829535788
NOAA10
1 16969U 86073A   95124.76340929  .00000100                      1486
2 16969   98.5093 128.9577 0014128 107.0037  253.2687 14.24932909448293
NOAA12
1 21263U 91032A   95124.71907533  .00000127                      4729
2 21263   98.5879 149.8954 0013884 27.5708   332.6206 14.22513809206246
NOAA14
1 23455U 94089A   95124.79066303  .00000088                      1648
2 23455   98.8983 67.6545  0009402 324.6654  35.3882  14.11508428 17690
METEOR 2-21
1 22782U 93055A   95124.00621906  .00000041                      3998
2 22782   82.5458 312.2050 0024080 47.8692   312.4508 13.83031638 84436
METEOR 3-5
1 21655U 91056A   95123.84353668  .00000051                      7991
2 21655   82 5488 250.2568 0014626 113.3929  246.8735 13.16838777178665
METEOR 3-6
1 22969U 94003A   95123.67068521  .00000051                      1654
2 22969   82.5601 190.1321 0015292 178.0130  182.1061 13.16728628 61020
OKEAN 4
1 23317U 94066A   95123.87250766  .00000223                      628
2 23317   82.5425 76.4590  0025946 339.2480  20.7707  14.73925525 30098
```

Frequencies: NOAAs 9/14 137.62MHz, NOAAs 10/12 137.50MHz
METEORs 137.30, 137.40 or 137.85MHz
OKEAN 4 137.40 MHz

Explanation of elements format above:

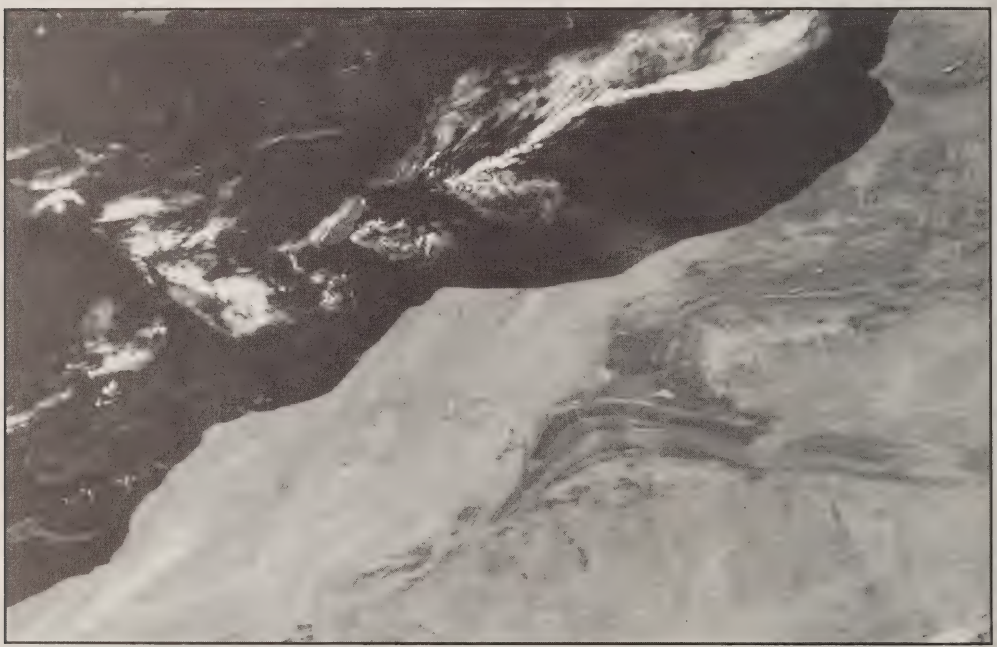
Line 1: NORAD catalogue number, International designation, Epoch, Decay rate (NDOT/2), Bulletin number (thousands omitted), Checksum (1 digit).

Line 2: NORAD catalogue number, Inclination, Right Ascension, Eccentricity (decimal point omitted), Argument of perigee, Mean Anomaly, Mean motion (8 decimal places), Rev. number, Checksum (1 digit). ⊕

RIG GIF LIBRARY

Peter Wakelin

Ferruccio Paglia's impressive antenna systems (illustrated on the back cover) have enabled him to get some very good images from satellites when close to the horizon. Disk 139 includes a selection of his NOAA HRPT images which are all as good as the one reproduced here. This NOAA 11 channel 2 image, received at 1709UT on 15 May 1994, depicts an area just out of the reach of UK members and includes southern Morocco and most of Western Sahara as well as the Canary Islands.



The Hubble Space Telescope has now been operating for five years and the quality of data received since the defective optics were corrected during a Shuttle mission has exceeded expectations. I have made up Disk 140 from recent images from this remarkable spacecraft made available by the Space Telescope Science Institute.

The disks now available are those listed in RIG 40 plus the following:

139 NOAA HRPT Europe, Mid East, N Africa.	Ferruccio Paglia
140 Hubble Space Telescope images	STScI

HERE'S HOW TO OBTAIN YOUR DISKS

The cost is £2 for the first disk plus one pound for each additional disk with no limit to the number ordered. RIG provides disks, packaging and postage. For small orders, UK members may prefer to sennd postage stamps rather than write cheques for small amounts.

UK members: Cheque or postal order made payable to Remote Imaging Group and sent to Peter Wakelin, 1 Charters Road, ASCOT, Berkshire, SL5 9QF. There is no credid card service for members in the UK.

Other members: Bank Draft (in Sterling and drawn on a London-based bank) or Eurocheque made payable to Remote Imaging Group and sent to Peter Wakelin at the address above. Overseas members may prefer to pay by credit card in which case orders (which will be subject to a 3% surcharge) should be sent BY MAIL to Mark Clarke, 9 Park Lane, Bulmer Tye, SUDBURY, Suffolk, CO10 7EQ, UK

ERS MONITORS FLOODING IN THE NETHERLANDS

J Lichtenegger & G Calabresi
ERS Data Utilisation Section, ESA/ESRIN, Frascati, Italy
[Reprinted from ESA Bulletin No 81, February 1995]

When the lower Rhine area was hit by floods at the end of January, ESA's ERS-1 satellite, with its day-and-night imaging radar, was able to monitor the situation constantly, even through thick cloud. The image on the front cover of this Bulletin [reproduced on inside back cover- Ed] shows three rivers - the Lower Rhine (top), the Waal (centre) and the Maas (bottom) - in a region just west of Nijmegen in The Netherlands. It covers an area of approx. 35km x 45km, with the town of Den Bosch near the bottom right of the scene.

This multi-temporal image shows the situation between 30 January (green) and 5 February 1995 (red), in comparison with a 'normal' situation last autumn (image from 21 September 1994, displayed in blue). The considerably swollen rivers are well delineated in magenta, while the 'normal' river courses can be identified as dark-blue lines.

The bright-red patches in the flood areas show what had re-emerged from the water on 5 February, whilst some bright-green patches elsewhere in the image indicate where flooding occurred between 30 January and 5 February.

Parts of the urban areas appear in yellow due to a change in radar illumination

direction, the ascending orbit on 5 February looking east-northeast having been combined with two descending passes looking west-southwest. This effect is enhanced by the higher soil humidity on the winter dates.

The data was acquired at the ESA/ERS-1 Receiving Station in Fucino, Italy, and processed by the ESRIN and EURIMAGE/Earth Watch Teams. ⊕

DESCRIPTION OF COVER IMAGES

FRONT COVER:
Part of the Antarctic coast at Anvers Island photographed by Peter Wakelin. See his article Antarctic Ice-Shelf Breaks Up.

INSIDE FRONT COVER:
Map of the area referred to in the article Antarctic Ice-Shelf Breaks Up. We are grateful to the British Antarctic Survey, Cambridge, for supplying this map.

INSIDE BACK COVER:
This multi-temporal image from ERS-1 is reprinted from the front cover of ESA Bulletin No. 81, February 1995. See ERS Monitors Flooding in The Netherlands in this issue. The European Space Agency issues a range of publications which RIG members may find interesting. Costs are low and in some cases there is no charge. Contact ESA Publications Division, ESTEC, Post box 299, 2200 AG Noordwijk, The Netherlands.

BACK COVER:
Upper picture: Italian RIG member Ferruccio Paglia owns this antenna set-up comprising 2x2x21el crossed 435MHz, 2x11ev crossed 145MHz, and a 1.2m dish for 1.7GHz all mounted on an azimuth elevation rotator. Some of his images now appear on GIF Library disk number 139.

Lower image: This early NOAA 14 image was received and processed at the Space Research Institute, Moscow. The time was 0920UT on 19 January and the spacecraft was passing north over snow-covered Kazakhstan. The course of the Ural River is marked by the dark line. The broadening of this dark line at the prominent bend in the river marks the city of Ural'sk and Orenburg is on the river at the extreme right edge. A map of this region shows a railway line crossing E-W through Ural'sk and passing well to the south of Orenburg. Surprisingly, the route of this railway is clearly visible on this image as a narrow, dark line even though its width must be well below the 1.1km resolution of the satellite's sensors. We are grateful to Michael Zakharov for making this image available on Internet. (ftp://d902.iki.rssi.ru/vol1/wgscan/wx/demo/images) ⊕

RIG HELPLINES

General enquiries	John Tellick	0181 390 3315
Meteosat information, NOAA information, Supplier complaints		

A copy of the Group's rules can also be obtained from John Tellick

Russian and Chinese satellite information	Peter Wakelin	01344 23200
HRPT	Peter Wakelin	01344 23200
PDUS	James Brown	01656 782632 *(not available on Sundays)*
Antennas and computing	John Boyer	01293 776862 *(7.00pm-9.00pm not Mondays)*

Schools/educational co-ordinator	John Tellick	0181 390 3315

Schools/educational enquiries	John Murray	Torquay	01803 386252
	Frank Bell	Godalming	01483 416897
	Tom Walter	Reading	01734 871330
	Bob Coombes	Haslemere	01428 642930
	John Din	Bristol	01454 773387
	Alan Wright	Norwich	01603 713449

Microcomputer specialists:

PC and printer problems	Mark Pepper	01344 777730 *(8.00pm-9.00pm)*
Commodore Amiga	Chris Pretty	01420 82752
Archimedes	Tom Walter	01734 871330

NOTE: We are grateful to the above members for offering their services to the Helpline. Please do not abuse the service by ringing them for queries other than those listed against their names.

All the helpline numbers listed under Schools/educational enquiries are situated in the south of England. John Tellick (address on page 2) would be pleased to hear from members in the educational field in other areas who would be willing to give help and advice. ⊕

REMOTE IMAGING GROUP

RIG SUBSCRIPTION - NEW MEMBER

If you would like to become a member and receive the Journal, photocopy this page, complete the form below, sign the declaration and send it to...

RIG SUB, PO BOX 142, Rickmansworth, Herts, WD3 4RQ, ENGLAND

The subscription rates for 1995 are...

UK membership	£10.00	Europe outside EC	£12.00
Europe EC	£12.00	Outside Europe	£14.00

Name _____ Call Sign (if any)_____

Address. _____

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_____Post Code_____

Country _____ Telephone No._____

Are you receiving:
Polar-orbiting Weather Satellites _____ Geostationary Weather Satellites _____

Do you require back issues? (see Rig Shop Corner) _____

Amount Enclosed £_____

Payment by Visa/MasterCard/Eurocard - there is no surcharge:

Card No._____ Expiry date_____

Signed _____ Date _____

Are you willing to have your name/address made known to members in your area? YES / NO. *(Delete as applicable)*

DECLARATION: I do NOT object to the Remote Imaging Group holding my Membership details on a computer.

Signed _____ Date _____

RIG SHOP CORNER

ALL PRODUCTS ARE FOR SALE TO RIG MEMBERS ONLY, FOR THEIR OWN PERSONAL USE AND NOT FOR SELLING-ON.
IN THE EVENT OF PROBLEMS WITH EQUIPMENT PURCHASED FROM RIG PLEASE CONTACT RIG IN THE FIRST INSTANCE AND NOT THE MANUFACTURER.

All prices shown include post and packing except where marked

Receiving / Decoding Equipment	**UK/EC Price**	**Overseas Price**
RIG*sat*-RX1 two-channel 137MHz self-build receiver.		
PCB, crystal IF filter and FETs	£12.00	£13.00
PCB and FETs only	£8.00	£8.00
RIG DARTCOM Meteosat Downconverter.		
Assembled and tested module in tin plate box	£155.00	£132.00
Complete, assembled and mounted in weather-proof box.	£190.00	£162.00
RIG DARTCOM VHF Scanning Receiver.		
Assembled and tested module with LED channel number display.	£135.00	£115.00
As above but with LCD frequency read-out instead of LED channel number display.	£179.00	£152.00
Both the above items are modules and require a box, together with several components, switches, etc.		
RIG VHF Preamp.		
Includes a bandpass filter and is ideal for mast-head mounting. Assembled/tested module; needs boxing.	£18.00	£16.00
RIG 1695MHz Low Noise Amplifier kit.		
Experienced constructors only.	£29.00	£25.00
Martelec JVFAX Interface Unit	£78.00	£70.00
Connecting lead £5 extra (specify whether 25 or 9-pin required)		

Antenna systems	UK Price
RIG CROSSED DIPOLES A Turnstile type design, in kit form	£26.00
RIG/TH2 47-element YCV loop Yagi (1.7GHz)	£85.00
JAYBEAM 5X-Y 2m 5 element crossed Yagi, in kit form	£55.00

DISHES and FEEDS not available by mail order. Contact Henry Neale

Crossed dipoles and the YCV loop Yagi can be dispatched overseas. Postage extra. Details on request from Peter Wakelin.

RIG Binders

Available by post from Gordon Fleming, 168 Blythway, Welwyn Garden City, Herts. AL8 1DU. UK Price £4.00 each, EC/European Price £4.50, Outside Europe Price £5.00. Cheques to *"REMOTE IMAGING GROUP"* please.

CD-ROMS	UK Price	EC Price	Other Price
Meteosat No. 2 Weather in Motion	£12.50	£13.50	£15.00

Back Issues of RIG Journals

		UK Price	EC/Europe Price	Outside Europe Price
RIG 8-11	1987	£5.00	£6.00	£7.00
RIG 12-15	1988	£5.00	£6.00	£7.00
RIG 16-19	1989	£5.00	£6.00	£7.00
RIG 20-23	1990	£6.00	£7.00	£8.00
RIG 24-27	1991	£6.00	£7.00	£8.00
RIG 28-31	1992	£6.00	£7.00	£8.00
RIG 32-35	1993	£6.00	£7.00	£8.00
RIG 36-39	1994	£6.00	£7.00	£8.00

Note: Prices quoted are for a set of four, including Post and Packing.

RIG 1-7 are currently out of print. Owing to depletion of some issues, photocopies may be supplied. Individual issues are no longer available (hardship cases excepted).

Ordering Information

All items are available from the Editor, Peter Wakelin and include return by UK 1st class mail (except antennas and Journals). Items to non-UK addresses sent via air-mail.

UK VAT is now applicable on sales to the following EC countries - France, Germany, Belgium, Portugal, Spain, Republic of Ireland, Austria, Sweden, Denmark, Italy, Luxembourg, Netherlands, United Kingdom (including Isle of Man). Members in these countries should use UK/EC price when ordering. EC members who are registered for VAT must forward their VAT registration No. to the Treasurer to enable them to receive VAT exempt goods.

As UK/EC prices now include VAT where applicable; receipts will be issued upon request. Remote Imaging Group VAT Registration No. 594 7483 83. Channel Isles: divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order.

Overseas members, Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque(s). (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.

All cheques made payable to *"REMOTE IMAGING GROUP".*

Credit Cards Accepted (Access/Visa/Mastercard/Eurocard) Add 3% to Total. Available by MAILORDER only from the Treasurer, Mark Clarke, 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ.

Please state type of card, Card No., Expiry Date.
All Credit Cards authorised before goods are despatched.
(Note: Ordering by Credit Card does not mean instant despatch!) ⊕

LATE NEWS:

The text on page 18 refers to **two** images but due to pressure on space one had to be removed at the last minute.

The editor would like to ascertain the number of members having Internet access. If you have access and have not e-mailed me in recent weeks then please send a brief message to peter@ascotrig.demon.co.uk

BULLETIN BOARDS

Orbital elements and other information of use to members are available from several electronic bulletin boards. The three listed below all offer free service and are available 24 hours a day. In addition to orbital elements (in both Amsat and NASA 2-line formats), the RIG and Timestep services include regularly updated weather satellite status reports indicating which ones are transmitting and their frequencies. The RIG board also offers a range of shareware programmes.

Telephone numbers:	RIG BBS	01945 440666 8bit, no parity, 1 stop bit
	Timestep BBS	01440 820002 8bit, no parity, 1 stop bit
	Dartcom BBS	01822 88249 8bit, no parity, 1 stop bit

RIG AT RALLIES

RIG has revised its rally diary for 1995. We shall be attending the following and look forward to seeing you. We will be showing RIG products and demonstrating imaging etc.

Elvaston Castle, Derby	11 June
Longleat, Wiltshire	25 June
Leicester	20, 21 October

SUBMISSION OF ITEMS FOR PUBLICATION AND COPY DEADLINES

Please send contributions, which should be original, to the Editor. Although typed and hand-written items are quite acceptable we would prefer longer pieces to be on a PC disk in one of the popular word-processing formats, ideally in Word Perfect. Drawings and diagrams may be submitted on disk, preferably in a Windows Meta File compatible format, but please send hard copy also. To reproduce well, satellite images must have a good range of tones. Contact the Editor for further information.

COPY DEADLINE FOR THE SEPTEMBER ISSUE: 25 JULY 1995

Advertisers' copy is required by 18 JULY 1995 and should be sent direct to Michael Gill (address on page 2).

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental Satellite Applications Journal

4821 Jessie Drive, Apex, NC 27502, USA

$15 US per year $20 all others, US funds

MasterCard / Visa OK with $1 surcharge

RIG*sat*-RX1

PCB for low-cost 137MHz receiver

Michael Gill - G6HOM and Bryan Taylor - G8TPC have co-operated in designing and manufacturing a printed circuit board for the two-channel receiver described in RIG 35. The board is pre-drilled although some holes will need enlarging for component fixings. Scanning is incorporated with PLL signal verification. The performance of the receiver is defined by a high quality crystal filter, obtainable from RIG, giving particularly good adjacent channel rejection. All other components (excepting the channel crystals from McKnight) are available either from Maplin or Cirkit: a full parts list is included with the board. To reduce costs some of the capacitors which can only be bought in multiples of 10 are supplied with the PCB. Also included are the schematic, layout and instructions for building and alignment. Advice and help will be available in case of difficulty. Total cost (excluding case) is about £40.

For prices and ordering information see RIG Shop Corner.

SO YOU HAVE YOUR DISH! HOW ARE YOU GOING TO MOUNT IT?

Just contact us and state your requirement.

Mounting steelwork for any size of parabolic or pyramidal horn antennae:

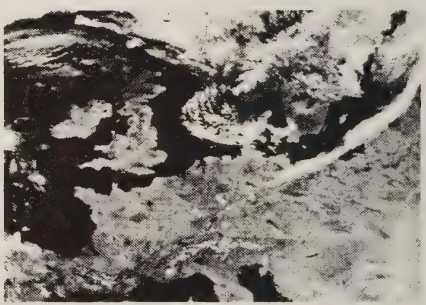
Sensible prices: Special discount for RIG members:

GUNDERSEN ENTERPRISES LIMITED

16 St John's Place, Rhoose, Barry, South Glamorgan, CF62 3EB. Tel/ AutoFAX 01446 710459

TH2 Imaging

34 Princes Gardens
Margate
Kent CT9 3AR
Tel : 0843 - 223831
Fax : 0843 - 862212



TH2SAT PC Weather Satellite Processing System Version 2.2

- Instantaneous control of input levels from keyboard while receiving
- Input levels automatically saved
- Large range of *simple to operate* image processing commands
- Very simple image pseudo-colouring facilities (including infra red)
- High definition images obtained due to high 4800 hertz sampling rate
- Colour animation included as standard
- Fully working demonstration program available for £3.50

Price £100 + postage (RIG members)

APT Hardware & Software

JVFAX Interface For those hundreds of you out there who have sampled the excellent JVFAX 7.0 software from Eberhard Beckashof, we offer this superb interface to do it justice. The JVF1 supports APT/WEFAX and FAX modes and features a dual microprocessor design, with separate inputs and individually optimized filter sections.

Interface and cables now available at special prices from the RIG Shop

Amigasat 3.2 The Amigasat package, like the Amiga, continues to go from strength to strength, with this new version fully supporting Commodore's 256 colour AGA graphics. Remember, if you've got an earlier version you can always upgrade to the latest for a modest sum. Amigasat remains the only package to *reliably* decode the digital headers from Meteosat for truly automatic reception. For a more comprehensive description of version 3.1 see our ad. on p74 of RIG36. **£139.95 + £4 p&p**

MSC30 Downconverter Our policy of continuous development ensures that the MSC30 Downconverter remains the finest you can own: Features include very low noise figure, high gain, buffered output for driving long cables, and good temperature stability. In addition, the MSC30 can be powered either by conventional 3-wire system or via the coax feed. High quality N-type input, BNC output, and housed in an IP65 sealed diecast enclosure. Comes complete with N-type/N-type cable, connectors etc. **£170 + £4 p&p**

MSD30 Dish A 95cm prime focus dish, of spun aluminium. Complete with MSF30 feed & heavy-duty ground stand. Gain - 22dB **£149.50 + £18 carr. & ins.**

MSF30 Feed Our popular 1.7GHz dipole feed for Meteosat, GOES, and GMS **£44 + £3 p&p**

MSQ20 Quadrafilar VHF Antenna. Very compact - ideal for boats and sensitive sites **£48 + £5 p&p**
with integral preamp **£64 + £5 p&p**

MSA20 Turnstile VHF Antenna. Comes with 20m cable and BNC terminated **£36.50 + £5 p&p**

MSL30 1.7GHz LNA Professional-quality low noise amplifier using HEMT GaAsFET first stage, and housed in sealed diecast housing. Has N-type input and output connectors, and power is provided via the output feed. N_f = 0.7dB, A_V = 28dB min. (other gains to order) **£134 + £4 p&p**

MSK30 137MHz Preamp A new design, offering low noise and wide dynamic range. The gain can be set by adjusting the supply voltage via the feed cable from 4v - 12v, to give A_V = 5dB - 22dB. Nf=1dB **£18 + £2 p&p**

Ordering Information
U.K. and E.U. customers add 17.5% VAT to above prices.
Overseas customers will be charged carriage at cost.
Payment may be made by cheque, postal order, or Visa, Access, and Mastercharge Cards.

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, Hants GU34 3AW, U.K. Tel / Fax 0420 82752

Timestep Offer to RIG Members
PROsat II Capture Card

PROsat II has become the most widely respected and definitive Weather Satellite Capture program used by RIG members. It will operate in most contemporary PC's (286, 386, 486 etc with SVGA) and uses one internal slot. All software features are selected with user-friendly mouse-operated pull-down menus. False colour can be added to good quality visible light images. Capable of receiving and decoding all known analogue weather satellites, PROsat II sets new standards in Software and Hardware design. Image processing, full colour animation and 3D are just some of the many features currently included. New features are constantly being added. Now technical support is directly from Timestep. Timestep Weather satellite systems are used and recommended by Arthur C. Clarke, author of "2001 : A Space Odyssey" and inventor of the communications satellite.

Other software comes and goes, sometime the flavour of the month, sometimes forgotten.
PROsat II just gets better and better ! When the new Okean 4 was switched on, it came as no surprise that PROsat II users merely clicked on OKEAN and achieved perfect results, first time.

Geostationary Satellites Meteosat, GOES and GMS are all geostationary satellites; they orbit at the same rate as the Earth and hence appear to be fixed in the sky. Images are therefore constantly available. The PROsat II system covers all known analogue geostationary satellites; images of the Earth's surface can be received as often as every 4 minutes. A small dish antenna is required together with some simple reliable hardware.

Polar Orbiting Satellites NOAA, Meteor, Okean and Feng Yun are polar orbiting satellites. They pass near to the poles about every 110 minutes. Each satellite passes over most countries twice a day at a different time each day. Their strength is such that a simple fixed antenna can be used. Direct readout of temperature along with latitude and longitude is an important feature of the software. Now land/sea and political boundaries can be superimposed on to the image and "nudged" if they are not quite perfectly aligned. All of the satellite data is stored; a full view of Infrared and Visible images are shown on the screen during reception.

Colour Animation Full screen, full colour animation is now standard. Up to 1,000 images can be automatically animated. The colour is realistic and computer processed (D2 section only) and even shows relative temperature by the shades of blue for the sea and green for the land. Clouds show up as white and shades of grey. Reception is completely automatic. Run the software and walk away; every time you pass, the computer will be showing the very latest sequence.

Geostationary Features
Images as often as every 4 minutes
Live display of incoming images in 64 grey scales
Auto schedule to save images
Pan and zoom to greater than pixel level
3D display
Median filter to remove country outlines
False colour with AutoSet
1,000 frame colour animation (option)
Transect between any two points
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

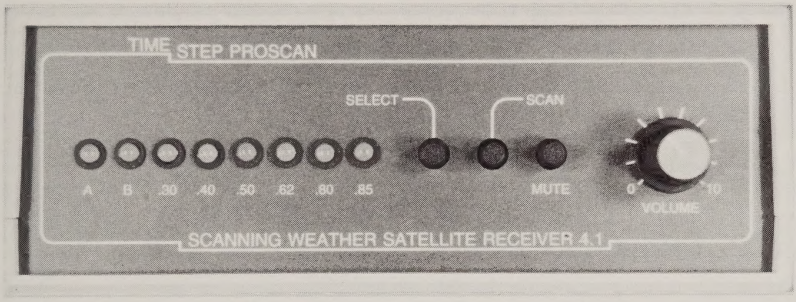
Polar Features
Reception of all polar satellites
Live display of incoming image in 64 grey scales
Auto schedule to save images
Saves the complete pass in full resolution
Temperature readout with no calibration
Latitude and Longitude gridding
Country and State outlining
Distance and Bearing between any two points
Your location shown on image
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

Track II The tracking program used by most serious satellite watchers. This is not public domain and was written by Peter Arnold our Cambridge Graduate. Up to 6 satellites can be shown on screen all at the same time. Actual locations, their footprints and their rise and fall times are always shown. To our knowledge, no other program provides these features.

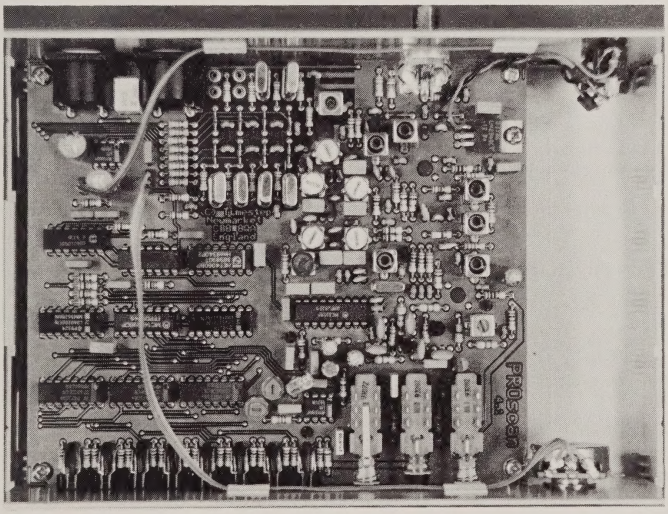
PROsat II card/software including Colour Animate & Track II £99.00
PROsat/PROscan connecting cable £12.00 All prices plus £6.00 carriage & VAT at 17.5%

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 01440 820040 Fax. 01440 820281

Timestep Offer to RIG Members
PROscan Polar Receiver



What do you want from a Scanning Weather Satellite Receiver ? a) Intelligent squelch that only responds to weather satellites and is quiet when no satellite is present b) To be able to read the frequency directly from the front panel when it stops on a satellite c) To be able to "lock out" unwanted satellites d) Resistant to pager interference up to the pager transmitter itself (where of course the field strength is low e) Resistant to pager interference at 1 to 2 miles where the field strength is at a maximum f) An unconditional 12 month money back guarantee g) Full technical support directly from Timestep **and** h) the ability to control the receiver frequency from the computer so that you are sure that **all** passes can be received in your absence.



The PROscan receiver uses a lot of filtering, 3 coils in the pre-amp (optional), 4 coils in the RF amp (total 7 coils at RF), 3 coils in the oscillator, 1 matching coil at first IF, 5 ceramic filters at first IF, 5 coils at second IF (total 11 IF filters) and a quadrature discriminator for linearity and high ultimate signal to noise. A preamplifier is not required for short cable runs but adds extra selectivity and makes up for feeder loss on longer runs.
PROscan receiver £185.00 VHF Preamp in diecast box £20.00 **Computer controller** £125.00
UK postage £6.00 plus VAT at 17.5%

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 0440 820040 Fax. 0440 820281

Trade Talk

** Summer news to **RIG Members** from Timestep **

APT Equipment At the RIG conference, many people expressed surprise at the range of products we had. Silly people ! If they had phoned for our full colour catalogue they would have known that we supply more Weather Satellite parts than anyone. In fact our policy is "If you Can Dream It - Timestep can supply it !"

So, don't hang around, pick up the phone now ! AND read our adverts, they do change from month to month.

PDUS The good news is that once you have bought the Key (from the Met Office/Eumetsat) and the Key Interface from us at just £150.00, you will get free access to whole earth images every 30 minutes and 2.5KM European images also every 30 minutes. Expensive; but like having NOAA every 30 minutes only twice as good ! Read the review in this issue from The Rev James Brown.

Meteosat PDUS new RIG prices

1.8M dish (inc dish feed)	£380.00
Dish feed (included with the dish above)	£ 40.00
P-HEMT Preamplifier (only when ordered with PDUS RX)	£100.00
20M cable	£ 15.00
Extra 20M cable and line amplifier	£ 50.00
2 channel PDUS receiver	£400.00
PDUS PC/AT card and full software inc **colour animate**	£150.00
PDUS Key interface card	£150.00

HRPT Following intensive development we now have a helical feed that works as well, if not better, than the dual feed and combiners AND it's £100.00 less to use ! It's lighter and doesn't need such elaborate metalwork to hold the dish to the rotator, hence the dish price is down too ! And it's available without the ground stand that you can get cheaper from your local TV satellite supplier. The tracking controller comes with a modified version of Track II and works perfectly with all but directly overhead passes, giving you time to have a cup of coffee, read the paper, AND get the best images you can have.... at any price.

1.1Km resolution, 5 spectral bands, 10 bit data, 80Mb data files, false colour, multi-spectral colour from any 3 bands (requires multi-spectral view II) and the greatest fun and resolution your are ever going to get (well for 10 years at least).

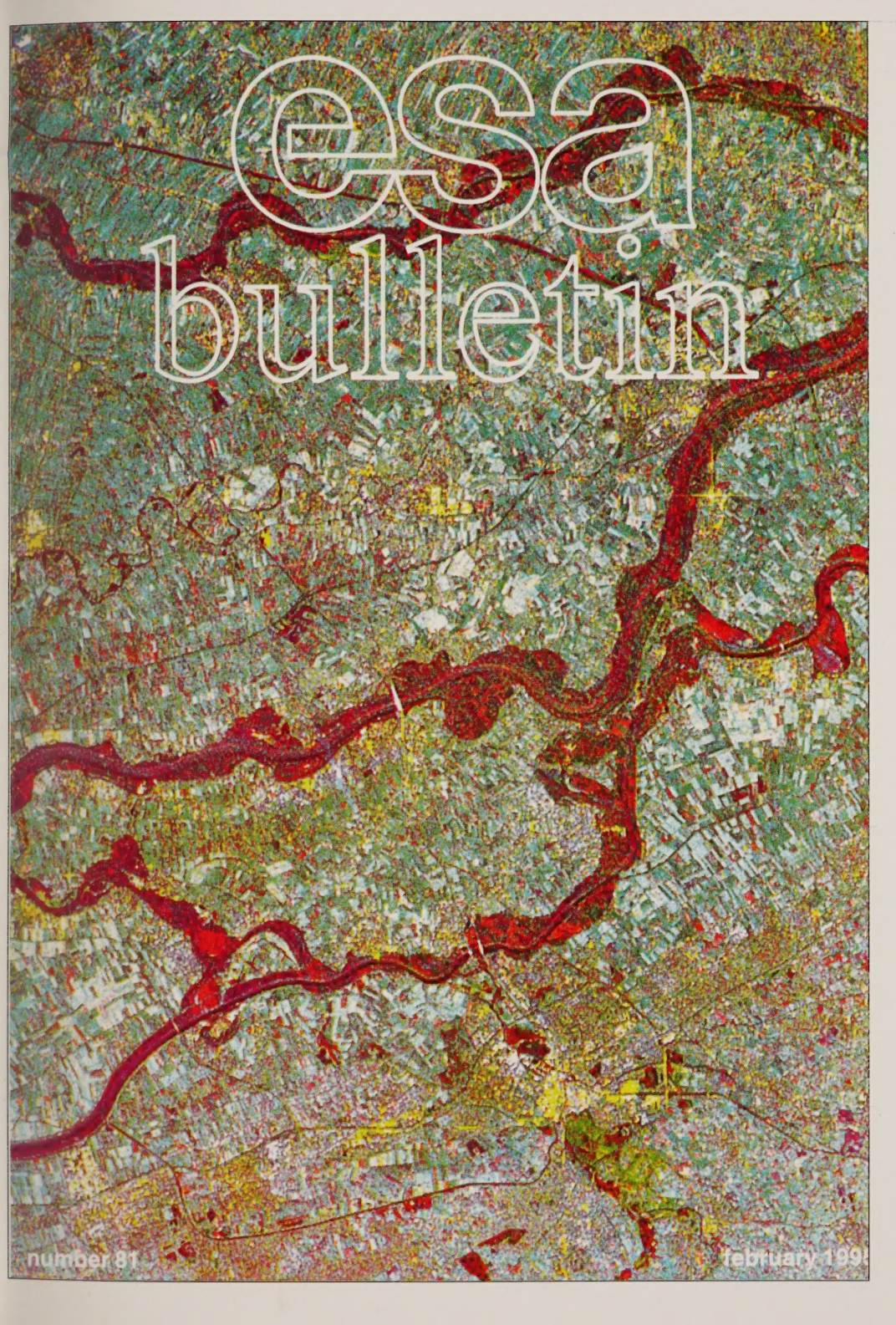
These RIG prices for HRPT really are silly, we WILL hold them for a little while yet though.

NOAA HRPT new RIG prices

90cm dish, helical feed and all metal work to fit Yeasu rotator	£150.00	RHRPTDISH
Yaesu R5400 Az-El rotator	£400.00	RYEASU540
20M control cables and heavy duty connectors pre-fitted must be ordered at the same time as the Az-El rotator	£ 80.00	RHRPTCABL
Tracking unit and software for automatic operation (needs separate computer)	£150.00	RHRPTAUTO
P-HEMT Preamplifier (at this price only with HRPT RX)	£100.00	RPPHEMP
20M signal cable	£ 15.00	RP20M
6 channel (5 fitted) HRPT receiver	£400.00	RHRPTRX
HRPT PC/AT card and full software	£150.00	RHRPTCARD
Complete system as above	**£1,445.00**	RHRPTCOM
Extra 20M signal cable and line amplifier	£ 50.00	RLINE
Helical feed for using your own dish	£ 45.00	RHRPTHEL

All prices plus VAT at 17.5% and carriage at £6.00 in Britain. Visa and MasterCard credit cards taken on orders over £25.00.

Timestep PO Box 2001 Newmarket CB8 8XB
Tel. 01440 820040 Fax. 01440 820281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